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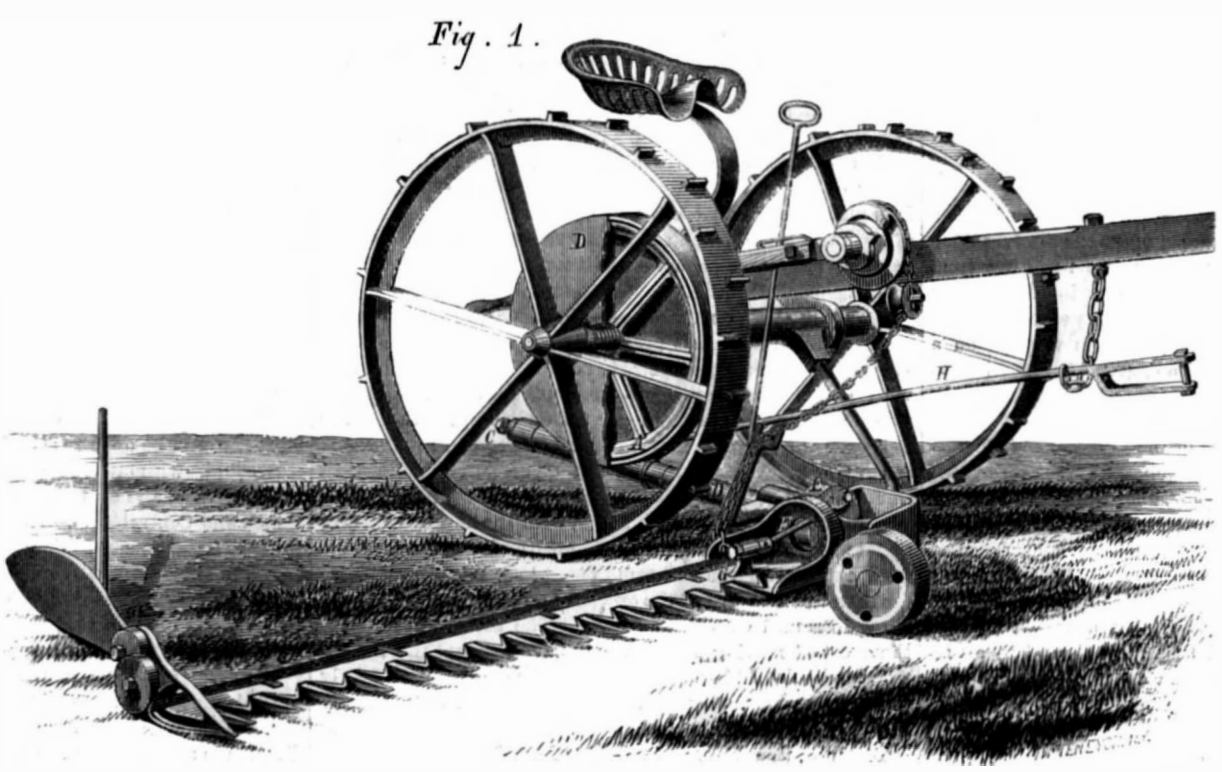
GOODWIN'S SCREW MOWER AND REAPER.

The Screw Mower and Reaper.

A new mechanical movement, as a possible element of future machines, always possesses a peculiar interest. This interest is greatly hightened when, as in the present instance, such a movement has been demonstrated to be of real practical value. The peculiar feature, of the mower and reaper shown in our engravings, is the application of a worm wheel and screw to the rotation of the crank shaft which drives the cutter bar, which worm wheel and screw possess features that entitle the arrangement to be classed as a new movement. Fig. 1 is a perspective view, the parts of the machine being lettered as follows: A is the worm gear wheel, B the screw, C the step pin, D the casing of the worm gear, a portion being broken away, E the connecting rod wheel, F the connecting rod, G the cutter bar, and H the draft rod.

Fig. 1.



The latter is so attached that the draft is applied to the rear of the axle in such a way as to throw nearly the whole weight of the machine on to the axle, and thence on to the driving and carrying wheels. Side draft is balanced by making the outside drive wheel slightly smaller than the inside, thus throwing more labor on the former. In regard to the worm wheel, it will be seen, on reference to Fig. 2, that it is peculiarly constructed, the teeth being formed very differently from those of the ordinary worm gear, where the screw actuates the wheel. In this case, the wheel impelling the screw, the teeth are so cut that they only operate on that side of the axis of the screw at which they disengage from their contact with the thread.

At first sight this may seem a trifling alteration from the old form, but in effect it so much reduces the friction of this kind of train that we are assured actual test shows a reduction of loss from friction in the application of power, in favor of this train, as compared with the best cut spur gearing. A moment's reflection will serve to convince our mechanical readers that teeth made to act on both sides of the axis of the screw will, at the side on which they enter, really act to consume the power applied at the other side, on account of their coming in contact before they have fully entered the interspaces, and the strong lateral pressure they exert upon the journals of the screw shafts. By the peculiar pitch of the screw thread employed in this movement, and the shape given to the teeth, the two do not come into contact until the teeth reach the position to act with greatest power upon the incline of the thread, and with the least friction.

By this means the end thrust of the screw, received by the step pin, C, is so reduced that, we are told, a nickel five cent piece, placed between the end of the step pin and its bearing in the end of the shaft, did not wear out during a whole season of active work in mowing and reaping, and that no trouble from heating has been experienced.

The screw is of steel, double threaded, and consequently revolves once on the passage of two teeth. The worm gear is of gun metal, which further reduces the friction. The simplicity of the arrangement is apparent, and we are assured the proprietors will at any time test their machine with others to show its superior lightness of draft.

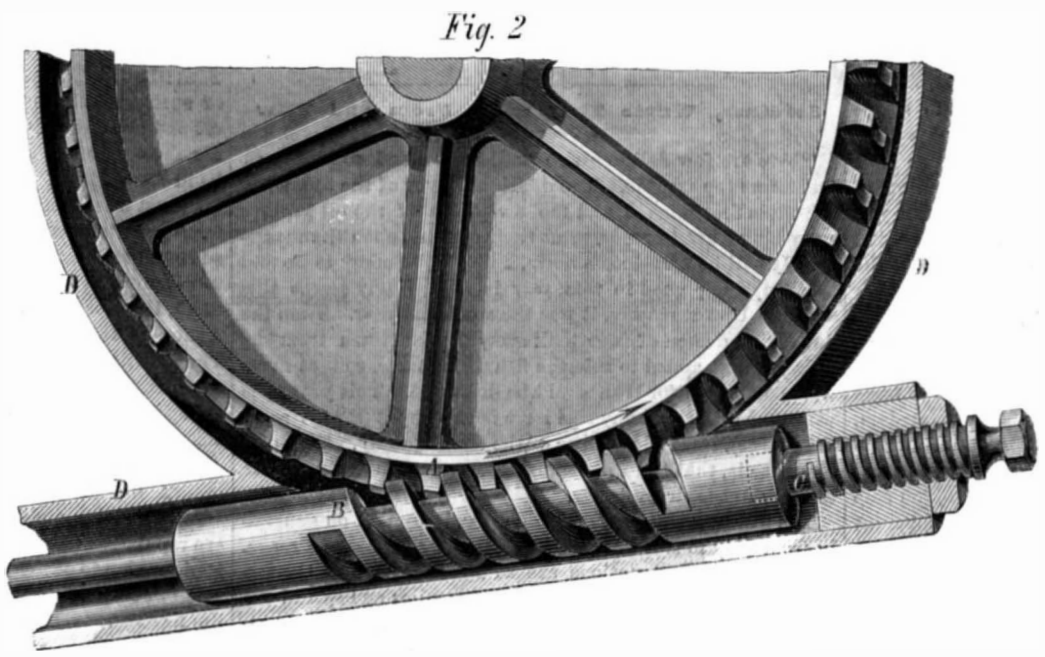
As shown in Fig. 1, the gear is inclosed in an iron case, which forms part of the frame.

The finger bar, shoe, etc., are attached to or taken from the frame, without bolts or pins, by a hinged coupling, that allows the bar to work below or above a level. The bar can be thrown entirely up by the driver while in his seat, without stopping his machine; the cutting apparatus may be adjusted to any required hight or set at any angle, and the main frame to swing under or over the axle, thereby giving a front or rear cut combined, without disturbing in the least the driving device. The frame may be cast all in one piece, or parts of it made of wrought iron.

On the whole, we incline to regard this an important and valuable improvement, an opinion that is strengthened by reports that reach us in regard to its working during two seasons of actual service.

Three manufactories are now making the machines, and at one, in Wheeling, Va., 1,000 machines are now building. The patent is now owned by the Universal Mower and Reaper Company, 91 Liberty street, New York, who will license the manufacture of the machines, or the application of the screw and worm gear attachment, on royalty. The machine was patented by Wm. Farr Goodwin, March 30, 1869, and August 29, 1871.

Fig. 2



A Burmese Hairy Woman.

A correspondent of the London *Times* writes to that journal the following particulars, referring to a hairy woman and her children, of whom he had before spoken in his letters: "When I was at Mandalay in 1859, I saw the same woman and three of her children. The eldest and youngest were hairy like their mother, while the second, like his father, presented no such peculiarity. The husband was a man who report said was induced to wed this woman to become possessed of the marriage portion which the King of Burmah had promised to bestow upon her on her bridal day. The bridegroom was a plucky individual at any rate, though his motives may have been mercenary. The hairy woman, whose name I forget, had a pleasant and intelligent face—there was nothing whatever repulsive in it. The hair on the face and breast was several inches long; on the forehead it was parted in the middle, and blended with that of her head. Of a light brown color on her cheeks, it paled gradually towards the bridge of her nose, and the centre of her lips, chin, and neck Those of your readers who have a copy of Colonel Yule's narrative of the embassy to Ava will see a good likeness of the woman, and a description of herself and family."

ROOFS, PAVEMENTS, AND SAFES, UNDER FIRE AT CHICAGO.

The office of the *American Builder*, at Chicago, sharing the common fate of the other periodicals, during the late conflagration was burned down. But the publishers, with commendable enterprise, have reproduced the publication, and the number for November, now before us, contains much interesting matter, from which we take the following:

ROOFS.

"The business blocks of Chicago were covered, chiefly, with paper coated with tar and gravel, a preparation commonly known as felt roofing. Even the 'fireproof' *Tribune* building was covered with this material, which has been in general use throughout the United States for a number of years. During the progress of the fire it became very evident that these roofs assisted materially in the spread of the conflagration. The heat was, of course, intense where adjacent buildings were in flames, the tar melted, and ignition was the consequence; so that roofs which ordinarily resist fire, in this instance were prime aiders in spreading it.

"The *Builder* has always been opposed to the use of this kind of roofing material, and now we insist upon it that architects and builders abandon it altogether. It may be well enough to use it upon isolated cheap dwellings, but let us have no more of it within the fire limits. Let no architect who values his reputation recommend it to his client. In place of paper and tar, we have tin, iron, or, what is better than either, concrete. This latter will endure fire, and it is not expensive. Our concrete pavements stood intact where great flagging stones flew to pieces. We commend the concrete for roofing purposes, and trust the architects may be induced to listen to reason and experience, and recommend it for all brick and stone edifices.

PAVEMENTS.

"Noticeable among the results of the late fire was the effect upon the different pavements. The Nicolson is, in many places, completely honeycombed, the fire having eaten its way downward into as much of the wood as was dry enough to burn.

"The concrete pavement, which had been laid down in small patches by way of experiment in different parts of the city, endured the test well, and is today in as good condition, apparently, as before the fire. So that, as regards one quality at least, there is little chance for comparison between the wooden and concrete pavements, so great is the advantage in favor of the latter. And there occurs no convincing reason why the concrete should not be more generally adopted. In the instances where it has been employed, the results seem to have been very satisfactory. The wear of heavy vehicles has produced little impression wherever the concrete has been properly laid, and the surface presented is even and well adapted to the transportation of heavy loads. Appearances certainly indicate that, in point of convenience and durability, the concrete is the pavement for the future. We have not the figures indicating the relative first cost of the different pavements, though the concrete is certainly expensive; but, unless a greater difference exists than appears likely, it would seem that economy and a regard for the public good demand a substitution of the concrete for the wooden surface of our streets.

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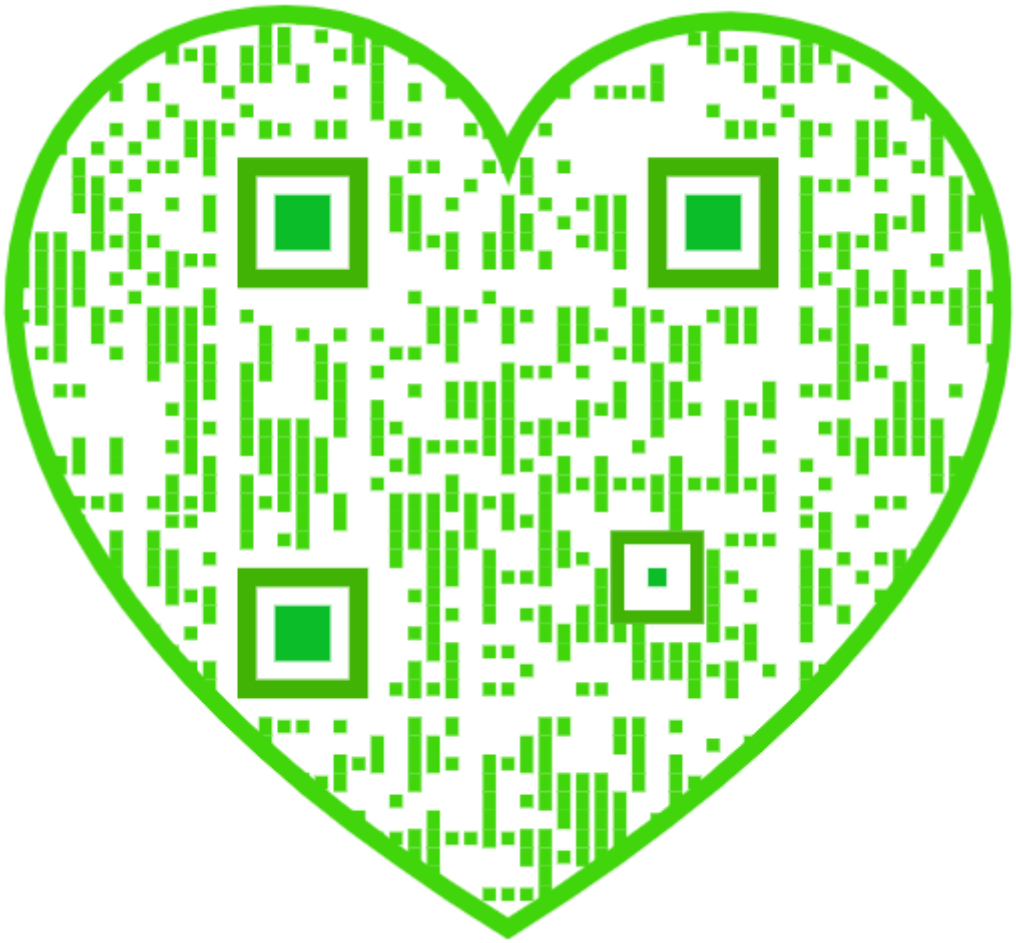

SAFES AND VAULTS.

"The experience of the late fire affords much information regarding the relative merits of safes and vaults for the preservation of papers or other valuables. The work of digging out safes from the ruins, which was begun as soon as the heat of the smouldering piles would admit, resulted in proving the fact that safes, however well constructed, would not, under all circumstances, preserve their contents unharmed. Those placed in wooden buildings, as a rule, held papers and books in good condition; the materials of which such buildings were composed burned so quickly and entirely, leaving nothing remaining to smoulder and retain the fire, that safes did not become heated through. But in buildings of brick and stone, the result was more unfortunate. The safes fell among masses of material which burned steadily and gave forth intense heat for days after the first fire, and thwarted any attempts made at removal. The safes lying in the midst of such heaps of fire became intensely heated throughout, and when efforts to remove and open them were finally successful, their contents were found in many cases to be ruined. Books, papers, and bank notes still retained their form, but had changed to black in color, and, upon the slightest touch, crumbled into powder. In almost an exact proportion to the length of time they had been forced to remain in the burning ruins, safes were found to have preserved their contents uninjured or partially or totally destroyed. It is evident that, while a well constructed safe will hold, uninjured, books and papers, for a time, yet, if remaining in the fire for a long period, no one yet made will fulfil its purpose.

"With vaults the result proved entirely different. In nearly every instance well built vaults held their contents intact. Bricks and mortar proved excellent non-conductors of heat; and upon the opening of large vaults which stood for some days in the midst of fire, their interiors were found scarcely warm.

"These discoveries will doubtless have the effect of introducing more largely the construction of vaults in buildings devoted to business uses; and the disasters resulting from their faulty construction, of which the one in the Custom House furnished a notable example, will perhaps induce more care in building. A vault badly built is worse than a poor safe, for the latter does afford a degree of protection to what is within it, while the former gives no protection at all.

It must not be inferred from the statements made above that the safes buried in the ruins of the late fire did not accomplish a great degree of good. Property of immense value was preserved through their agency, and, where not exposed to heat of the most intense character and for a long time, the safes generally stood the severest test well, and reflected credit on the makers, and must continue to be used, even where vaults exist; for, to secure perfect safety, valuables must be placed in a safe surrounded by a vault; and, for ordinary fires, safes have proved themselves equal to all requirements. But for such occasions as the late fire, only vaults can afford the perfect security needed."

DOWN IN THE CAISSON OF THE EAST PIER OF THE ST. LOUIS BRIDGE.

[From the Railroad Gazette.]

The grand entrance is a brick shaft dropping vertically to the iron girders, and thence is finished in iron through the air chamber. The steps descend spirally; you find yourself hemmed in by the circular walls of the well. On each side of you are iron doors, about 18 inches square and 30 inches from the floor. The place is damper than a parlor, but drier than a well 60 feet below water surface should be. This you notice while a man who is sweeping the floor tells you that one of the doors will be open in a moment. There is a sound as of a whistling of air through pipes, and soon a door does open, and a man within beckons you to step through, which you do, into an iron bandbox, say 6 feet in diameter and about 9 feet high, containing several pipes with air cocks upon them, and a seat. As your companion has a candle, you observe another similar iron door opposite to the one by which you entered. Your companion now closes the latter and turns one of the cocks, when there comes in, with a sharp, loud hiss, an atmosphere which is destined to arrive at a normal pressure of about 40 pounds to the square inch. Directly you feel a severe pain in one ear. Your guide asks you concerning it, and directs you to perform the motion of swallowing, which you do and are relieved. After this you swallow involuntarily. The guide now tells you, speaking in a key above the hissing of the entering air, that the strength of 40 men could not open the door through which you have just passed, and that the opposite one will shortly be loosened. Soon this occurs, and you slip upon a floor of loose sand, which, illuminated by the candles of the workmen, looks like bright yellow sugar just turned out fresh from the hogshead. You walk through it with great freedom, and even when passing through one of the log girders, which divide the chamber into three compartments, longitudinal with the pier, by an aperture about 18 inches square, you step deep into a loose pile of it; you step out with little apparent effort. A little to your right and extending downwards from the ceiling is a pipe with a loose valve hanging to the end of it and palpitating like the tongue of a hot dog. This and others around supply the apartment with air. Upon your left a man is shovelling sand into a trough of water. Into this trough is encased the lower end of an iron pipe which drops from the ceiling. Near the top of this another pipe, which comes through the masonry parallel with it, turns into it and a little upwards. This is the sand pump. All the sand which the man throws into the trough is sucked up by the vacuum, created by a stream of water which comes down the second pipe, and is projected upwards through the first. And so this goes on regularly for days: the sand being excavated, the caisson with its load of stone sinking, and the masonry added continually until the rock is reached. Then men say that "another engineering epoch has occured. The east and largest pier of the St. Louis Bridge has safely reached the rock through a depth of ninety feet."

Still walking around, you notice that the peculiar bright appearance of the sand comes from the fact, that although the air pressure has driven all the free water from its interstices, a film surrounds each grain, retained there by an adhesion superior to the pressure, which brightly reflects the yellow light from the candles.

Now talking of candles reminds us of the Chief Engineer's remarks upon the danger of fire, in this triply compressed air, and his experiments thereon. These, moreover have been noticed as not agreeing with the experiments made by Dr. Frankland (Philosophic Transactions, 1861). As this subject must become of importance, in view of the increased use of compressed air in hydraulic construction, it may be well to lightly compare the two series of trials, and show that there is no discrepancy, but an actual agreement. Captain Eads plainly speaks of the danger of fire, and instances several cases where the clothes of the men had actually caught the flame, as showing the increased combustion arising from the increased supply of oxygen.

Dr. Frankland, in the above mentioned memoir, on the contrary, shows that from the rarefied air upon the top of Mont Blanc to the laboratory condensation of three atmospheres, there was no more tallow consumed and therefore no more combustion in the one case than in the other, and that the quantity agreed precisely with the quantity of material consumed under the normal pressure. The discrepancy, however, is explained by the very reasons deduced from his experiments, which he gives as the decreased mobility of the atoms of oxygen arising from the increased condensation. It is plain enough that, other laws being equal, the mobility of the particles may be in exact inverse ratio to the density, in which case the combustion will remain the same through all changes of pressure.

But would Dr. Frankland's experiments, if, instead of being conducted in a bell glass practically air tight and the pump stopped as soon as the desired pressure was obtained, made with a bell glass leaking at every pore, so that the pump would constantly have to supply the deficiency, with moving figures flitting from place to place, always in motion and constantly breathing, with the test object—the candle—continually changing its position, and sometimes blown upon with a strong blast from the lungs, with the figures violently agitated when the fire touches them—would, we say, his experiments have given the same result? It would seem not; for then the mobility of the oxygen particles would not have been decreased with their density. The action of leakage, the effect of moving bodies, would have restored the mobility, and we should have three times the oxygen with nearly the same, and not one third, the mobility, and consequently nearly three times the combustion.

There is, therefore, great danger from fire in compressed air, and a strong light, which could be retained in one place where the air is still, is a desideratum.

But we have now visited the subfluviatile chamber and seen its wonders, and so returning through the air lock, where the letting off of pressure does not affect the ear, we are at the foot of the spiral staircase.

Here comes the tug of war. Your strength which has been increased by the compression, has now fearfully diminished. You are weary and without nerve for the ascent. You feel, indeed, as a wet rag might feel if suddenly brought to a consciousness of its limpness. So with sloth you drag your weary way to the top, and finding the air still bleak, and wet, and Novemberish, and that when you get upon the streets your umbrella is twisted in every direction by the wind save the direction from which the rain comes, you wish you were back again deep under the river, with a plentiful supply of tempered air, strengthened with oxygen, and a steady umbrella over your head capable of turning aside the northwest wind and the full flow of the Mississippi River.

Sardines, Where They Come From and How Preserved.

There are few delicacies so well known and so highly esteemed as the sardine. The delicious flavor of the fish when the tin is first opened, and the sweetness of the oil (always supposing a good brand), print their charms upon the memory. It will be unwelcome news, however, to many to be told that anything good in this way is exceedingly scarce this season. Unfortunately, it was the same last year. Then the destroying demon of war took away the fishermen from the villages, and, added to this, the fish were scarce, so that more were contracted for than could be delivered. This year it is worse. Few fish of any size have been caught (except some very large), least of all those of the finest quality. The consequence is, that the French manufacturers are again unable to carry out their contracts.

The fishery, says the London *Grocer*, is carried on generally from July to November, all along the west coast of France. Two of the largest stations are at Douarnenez and Concarneau. Fleets of boats go out some few miles and spread out their nets, by the side of which some cod roe is thrown to attract the fish. The nets are weighted on one end and have corks attached to the other so that they assume a vertical position—two nets being placed close to each other, that the fish trying to escape may be caught in the meshes. Brought to land, they are immediately offered for sale, as, if staler by a few hours, they become seriously deteriorated in value, no first class manufacturer caring to buy such. They are sold by the thousand. The curer employs large numbers of women, who cut off the heads of the fish, wash, and salt them The fish are then dipped into boiling oil for a few minutes, arranged in various sized boxes, filled up with finest olive oil, soldered down, and then placed in boiling water for some time. Women burnish the tins; the labels are put on, or sometimes enamelled on the tins, which are afterwards packed in wooden cases, generally containing 100 tins, and then are ready for export.

It does not always seem to be remembered that the longer the tin is kept unopened the more mellow do the fish become; and, if properly prepared, age improves them as it does good wine. But if they are too salt at first, age does not benefit them—they always remain tough. The sizes of tins are known as half and quarter tins. There are two half tins, one weighing eighteen ounces and the other sixteen ounces gross. The quarter tin usually weighs about seven ounces, but there is a larger quarter tin sometimes imported. Whole tins, and even larger ones still, are used in France, but seldom seen here.

As is well known, the sardine trade is an important branch of industry, very large quantities being consumed in France; and the exportation to England and America is truly wonderful.

Proposed Ship Canal in Russia.

Under the heading of "Internal Navigation in Russia," *Le Moniteur des Interêts Matériels*, published in Brussels, gives the following article, which we translate:

"Since the completion of such immense works as the piercing of the Isthmus of Suez and the Mont Cenis, simply and easily done in a few years, none of the gigantic enterprises which our ancestors dreamt of, and for many years considered impossible, are likely to frighten engineers or capitalists. The union of the two seas in the south of Russia, has been, as is well known, ever since the time of Peter the Great, the "holy wish" of the Government of Russia. Of what importance to the great empire would a canal, permitting her to send her fleets into all the ports of Persia, and giving a support to her power in the East, be! And what an accession of power would result from the possibility of carrying, to one destination, the united fleets of the Black and Caspian Seas!

"From commercial and industrial points of view, we might predict a great future for such a canal; for a sea, hitherto closed, would be open to all maritime nations; and their vessels could, without discharging cargo, penetrate into the heart of Asia, and also carry to the West all the products of Persia and Central Asia. Russia has only too many reasons to favor such an enterprise; and accordingly the Czar instituted, in 1864, a commission charged to consider the feasibility of the project. The chief of this commission, M. Blums, believes the plan to be practicable; and, if we study the map with a little attention, the immensity of such an enterprise reduces itself to proportions comparable to those of the Isthmus of Suez Canal.

"The distance which separates the Sea of Azov from the Caspian is about 650 or 700 Russian versts, or 700 kilometers (about 441 miles). The Isthmus of Suez is 150 kilometers across. But two important rivers, the Manitscha and the Kooma, both take their rise in the Caucasus, and empty their waters respectively into the two seas; and using their streams would permit a considerable abridgment of the labor. The engineering difficulties will probably be greater than at Suez, where the highest rise in the level was only 20 meters. It will be necessary to leave a much larger margin for contingencies, and it is well known to what an amount these came in the earlier work. Still other new problems present themselves. Here, however, are the figures given by the engineers of the abovementioned Russian commission:

"A canal can be constructed from one sea to the other for 81,000,000 silver rubles (about $60,750,000). The measurement of the soil to be removed will amount to 550,000,000 cubic meters (about 720,000,000 cubic yards).

"The Russian Government cannot, at present, hope to see other nations concurring in this enterprise. Foreign commerce will naturally prefer the shorter and better canal of Suez; but the junction of the Sea of Azov to the Caspian is of such importance to the Russian empire, both from political and commercial points of view, that the Government will not shrink from a considerable expenditure. And it would be in Russia itself that the greater part of the needed capital must be sought; and it would there be possible to obtain it, by insuring, as has been done to the railway enterprises, a sufficient interest for the money. It would be easy, moreover, to promote, in the countries which the canal is intended to unite, the creation of banks and other commercial establishments, by the concession of lands and of facilities of transit. The question is of permanent importance to Russia, and from the present state of public opinion in that country, and from the spirit attributed to the Government, it will probably be answered in a sufficiently short time."

A Square Toed Plan for Making Money.

A Boston boot and shoe firm, which has an extensive Northern reputation by reason of its loyalty, lately hit upon an ingenious plan to push their trade in the South. They invented a sort of a square toed boot, on the leg of which was imprinted the likeness of Gen. R. E. Lee, and this was to go into the general Southern market. A finer boot was then made with the picture of Stonewall Jackson, also imprinted on the boot leg, and this was intended especially for Virginia dealers. The firm then applied for a patent on their trade mark. The Examiner to-day decided that the application could not be granted on the ground that these trade marks tended to encourage disloyalty in the South. The firm have taken an appeal to the Commissioner.

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Comparative Merits of Narrow and Regular Gage Railways.

Mr. Silas Seymour, the well known consulting engineer, was lately applied to by Mr. Marshall O. Roberts for his opinion on the subject of narrow gages for great trunk lines of railroad. Mr. Roberts, as President of the Texas Pacific Railroad Company, had received from the chief engineer of that company, General G. P. Buell, a report in favor of the narrow gage of three feet six inches, the reasons for recommending it being, first, that in the construction of the road bed, the difference of cost will be 30 per cent in favor of the narrow gage; second, in the construction of the superstructure, the difference of cost will be 45 per cent in the same direction; third, with proper construction of rolling stock, a speed of thirty-five to forty-five miles per hour can be attained with perfect safety on the narrow gage; fourth, the construction of rolling stock will cost 50 to 55 per cent less; and, fifth, in loaded trains of mixed freight and cars on the 3 foot 6 inch gage, the percentage of dead weight to load will be about 47-100, while in a similar train on the broad gage it will be about 75-100.

Mr. Seymour does not agree with General Buell either in his premises or his conclusions, and proceeds to take up his "five reasons" and dispose of them one after another. After speaking of the difficulty of making any practical comparison he takes up the matter of the cost of the road bed. The side slopes and embankments, side drains, bermes, wings, end walls, and coping of culverts, he says, would cost the same in both cases, as would also truss bridging, as that used on the broad gage road is as narrow as will allow of the requisite lateral bracing to keep the bridge in perfect line and adjustment. The difference in cost then he declares to be, at the most liberal estimate, only the cost of a strip in the middle about a foot and two inches wide, which would be less than 10 per cent of the whole. The saving in the cost of the superstructure, he then proceeds to show, would be only the value of one foot and two and a half inches in length cut from the middle of each tie, as the same weight of rails is required in each case for trains of the same weight, and any advantage to be gained by multiplying trains and using lighter engines is equally applicable to both kinds of road. In the matter of cars, he claims that fully as much is lost by the necessity of using a larger number as is gained in the lower cost of smaller cars. The cost of locomotives, providing the same power is used, will be no greater for the wide than for narrow gage; and if there is a difference, it will be in favor of the larger engines. In dealing with the third reason of General Buell, Mr. Seymour declares that he does not think that "thirty-five to forty-five miles per hour with perfect safety" can be attained on any road, and that it is generally conceded that "in the ordinary condition of our roads and rolling stock a wide gage is the safest for high rates of speed."

The fifth and last reason of the chief engineer of the Texas Pacific, in favor of narrow gage, is characterized as the weakest of all the arguments advanced in its favor. There is no means, says his critic, for making any satisfactory test in this matter, but he ventures the opinion that a platform ten feet in width, of the same proportionate strength as one of the same length and five feet wide, will be found to be of less than twice the weight, and that less than twice the power will move it. The same is true of box cars and saloon coaches to a greater degree, and the conclusion is that the disadvantage of a greater proportion of dead weight is wholly imaginary. Mr. Seymour declares that all the advantages claimed for narrow gage roads can be realized with greater economy and safety by using the same character of rolling stock on the 4 foot 8½ inch roads, and that the slight additional cost of construction of the road would be more than overbalanced. The advantages which he claims for the 4 foot 8½ inch gage over that of 3 foot 6 inch he sums up as follows:

1. If commercial advantages are to be gained by exchanging cars with connecting lines, you would be in a condition to secure them.

2. A train, like a wagon, may be hauled much easier with wheels of large than small diameter. This width of gage allows of considerably larger wheels, under its ordinary rolling stock, than are admissible upon the narrow gage; but with this proposed reduced hight of cars upon the wider gage, the wheels may be made so much larger that a very material saving will be effected in power.

3. Having a greater base of track in proportion to the hight and width of your cars, the irregularities in the track would be less apparent; and you would certainly make as fast time with greater safety, or faster time with equal safety than you could upon the narrower gage.

4. The hight and width of train being less than that in general use upon the wider gage, the atmospheric resistance would also be proportionately less; and you could make faster time with the same amount of power than is made upon the ordinary 4 foot 8½ inch railroads.

5. You would relieve the entire question, or at least the wider gage portion of it, from the enormous load of extra dead weight which it has heretofore been compelled by its adversaries to carry, because under this arrangement it would evidently be reduced to merely the weight due to the extra length of axles.

6. If time and experience should happen to demonstrate that your chief engineer is wrong in his present convictions upon this subject, you could correct the mistake hereafter at much less expense than you could if the grading, masonry, superstructure, rolling stock, etc., were all adapted to the narrow gage.

The subject, as presented to the mind of the engineer, naturally divides itself into four general propositions; First, comparative cost; second, comparative facility and economy in packing or loading; third, comparative economy in hauling; fourth, comparative advantage of a gage common to connecting lines. As to the first, he admits that the advantage is slightly in favor of the narrow gage, but to nothing like the extent claimed by the advocates of the extreme narrow gage theory. As to the second, he claims that the advantages are so greatly in favor of the wider gage as to far outweigh the additional cost of construction. He believes that rolling stock for the wider gage can be constructed cheaper and of less weight in proportion to its comfort and capacity than rolling stock of the same relative width, strength, and durability adapted to the narrower gage, and and that it can be used for equal rates of speed with greater safety. He believes that there is a great deal of unnecessary and non-paying weight carried, and a good deal of useless friction to overcome on all railroads, but does not think it altogether chargeable to the width of the roads. He concludes by recommending for the Texas Pacific Road a 5 foot gage as better still than the 4 feet 8½ inches. Mr. Seymour fortifies his views by a liberal citation from the arguments of other eminent authorities on the subject.

Chills and Fever.

Hall's Journal of Health, for November, has the following seasonable article on the above subject. Chills and fever and bilious fevers have prevailed to an unusual extent in the vicinity of New York this season, as well as in many other parts of the country.

Dr. Hall says: It very generally prevails in the fall of the year over large sections of country. Scattering cases are liable to occur anywhere. These arise from individual indiscretions; but where large numbers of persons in communities are attacked, there some general cause must prevail. This cause has been attributed for ages to "miasm," an emanation from the earth so subtle in its character, that for more than a century the greatest skill of the ablest chemists was not able to detect its nature or define its quality. A bottle of air taken from the most deadly localities was submitted to the most careful and searching analysis without the detection of anything solid, gaseous, or liquid; nothing could be found in the bottle but air, thin air. But the microscope has come to the aid of the alembic, and has discovered in this, the miasmatic air, multitudes of living things. When bottles of this air were taken from the banks of a Southern *bayou*, and placed in the chamber of a man in Chicago by Dr. Salisbury, he was taken with chills and fever in a few days, and these living things were found on his tongue and within his mouth; while not a single one was to be found all over the city, except in that one man's mouth, in his chamber, and in the bottles. Whether this life is animal or vegetable, is a matter of dispute, yet it seems capable of producing chills and fever; but whether animal or vegetable, the laws which regulate the action of miasm on the human system remain the same, and the mode of production, or the causes of the generation of this miasm, remain unchanged; and these laws have been determined and described with wondersul accuracy. This miasm results from warmth, moisture, and vegetation combined; if one is absent, miasm is not formed; vegetable matter will not decay unless there is moisture, it will dry up; it will remain under water a thousand years without decay, as witness the wooden piers of ancient bridges, as sound to day as when they were driven by Adam's grandson, or somebody else who lived a long time ago. The heat must act on the moisture before miasm becomes a product. This miasm, to be injurious, must be taken into the system by breathing into the lungs, or by swallowing into the stomach. But cold, as the "first frosts" which are everywhere known to make it innocuous, condenses this miasm, makes it so heavy that it falls to the surface of the earth, and can be neither breathed nor swallowed; on the other hand, heat so rarefies the air in which this miasm is contained, that it carries it up towards the clouds, where it is no more breathed than if it laid immediately on the surface of the earth. Hence heat and cold are antagonistic to the disease-producing effects of miasm on the human body. To freeze it out is expensive, but to antagonize it by heat is possible, is everywhere practicable.

From an hour after sundown to an hour before sunrise, the cold causes it to settle on the surface of the earth. An hour after sunrise and until an hour before sunset, as a general rule, it is too high above our heads to injure us, in consequence of the heat of the weather.

As the heat must be over eighty degrees for several days to generate miasm, it follows that the time, during which we are required to battle with it, is at sunrise and sunset during the spring and fall months. But to make it safe from the first blade of grass in spring until the killing frosts of autumn, dress by a cheerful blazing fire, and take breakfast before going outside of the door; come home before sundown, take your supper before its setting, by the same cheerful blazing hearth, then go and do what you please. You may sleep under a tree, or on a swinging limb, and defy fever and ague for a century, if you only keep warm, abundantly warm.

Val de Travers Asphalte a Failure.

We see, the London *Building News* says, that the shopkeepers and others of the Strand and other parts of London are petitioning to have certain thoroughfares paved with asphalte. Now, considering the many advantages attending the use of this material for paving purposes, we are not surprised at the growing feeling in its favor, and particularly just now after a summer's experience. But we entreat all who are asking for its more extensive application to pause a little. Let them have the experience of winter as well as summer before they decide. When passing through Leicester square yesterday (October 19) about mid-day, we saw that hundreds of people had collected. We thought at first that some procession or other spectacle must be coming. We were, however, soon undeceived, for the horses while passing over the asphalte pavement were falling down so fast as to excite a great deal of public attention and curiosity. Though we were not present more than a few minutes, several horses slipped and fell during the time, and others that did not fall were in peril of falling while passing over the pavement. Some cabdrivers as soon as they got on the asphalte cautiously turned back again, others turned away at the very first turning, and all that passed over had to do so slowly and with extreme care. We don't know whether the same kind of pavement in other parts of London is so dangerous during humid weather as that recently laid in Leicester-square: if so, the demand for tearing it up will very soon be stronger than that for laying it down. No doubt Val de Travers asphalte is very good for Continental cities, but for London and other large English cities, during winter, it will be found altogether unsuitable.

Lequesne's Commutator.

The elements of an electric pile can be grouped according to three classes, that of tension, of quantity, and of series. When, with the same battery, successively different effects are produced, or when the action lasts long enough to show a sensible decrease of energy, the groupings of the elements can be changed according to the variations of power or of resistance. The change involves a marked loss of time when it is necessary to produce it by manœuvring the wires of the electrodes. But one can obtain the commutations for obtaining various grouping by the simple movement of a handle. M. Lequesne is the inventor of a commutator of this kind, and M. le Comte du Moncel states, in his report to the *Societé d'Encouragement*, that it is more complete and more efficient than the similar apparatus already in use. M. Lequesne gives to his special commutator the name of Voltamé-reiste. It is composed essentially of a cylinder, to the surface of which is applied a series of metallic plates, divided up in a particular manner with regard to the various systems of groupings of the battery, and of two systems of rubbing plates, bearing on the cylinder and in contact with the divided plates and two different generators.

The one of this series is directly in connection by wires in the positive poles of the different elements of the battery, the other with the negative poles, and it is only necessary to turn the cylinder, in such a manner as to place under the rubbing plates such combinations of the divided plates, to obtain immediately the desired grouping of the battery.

To obtain the element of quantity in the battery, it will be sufficient to bring, under the two series of rubbing plates, two continuous metallic plates of a length equal to that of the two series of rubbers. The battery will then work as if it were composed of a single element, with a surface equal to that of the whole of the elements.

To add all the elements in tension, it is necessary to have a number of metallic plates equal to half the number of the elements of the battery, all ranged on the same generator of the cylinder, and of a width sufficient for the plates of the two series to be applied simultaneously, two by two.

Lastly, to obtain a series, that is to say, to obtain from a battery of 24 elements the current which should give, for example, a battery of 8 elements of threefold the surface, it is necessary that the divided plates alternate from the one to the other series of rubbers as many times as there are series of elements, for instance, eight times, in the examples given above.

M. Lequesne constructs the apparatus for 24 elements, and combines them together when he operates with batteries of a greater number of elements. He places in his cylinder eight series of plates, permitting eight groupings by series, that form a battery of 24 couples.

Speed of Carrier Pigeons.

The Newark *Advertiser* gives the following: The wonderful flight of the carrier pigeon Tempest to Montclair, N. J., was noticed some time since. We have now to record the still more extraordinary time of two other birds sent home. The following notes were found on them on their arrival:

DEAR FATHER—Sept. 15, 1871—Lat. 27 deg. 10 N., long. 79 deg. 30 W., 1,004 statute miles from Montclair, N. J.,—I will let the male bird Tornado go with this note at exactly nine o'clock A. M., New York time. I let the bird Tempest go on the 10th. She rose up about 500 yards high, and then made one tremendous plunge to the North, and was out of sight about as quick as a flash of lightning.

HARRY C. BLEECKER.

DEAR FATHER—Sept. 21, 1871—Lat. 26 deg. N., long, 93 deg. 5 W., 1,596 statute miles from Montclair, N. J.—I will let the old bird Typhoon go with this note at exactly eight o'clock A. M., New York time. He is a powerful bird, but he has a fearful job on hand. He must go through it or perish. All well.

HARRY C. BLEECKER.

The bird Tornado arrived at Montclair the same day at three o'clock and seven minutes P. M., making over 196 miles an hour. Typhoon arrived the same day at three o'clock and fifty-four minutes P. M., and fell dead on his arrival, but he brought the note in the unprecedented time of 202 miles an hour.

ELECTRIC LIGHTS FOR SHIPS.—M. Marten suggests the plan of attaching to sailing vessels a screw propeller, the motion of which shall be obtained from the movement of the ship. The author proposes to utilize the power so obtained, in giving motion to an electromagnetic apparatus, from which such vessels may be supplied with the convenience of an electric light, thus dispensing with the use of oil, and gaining besides the advantage of the greatly increased illumination.

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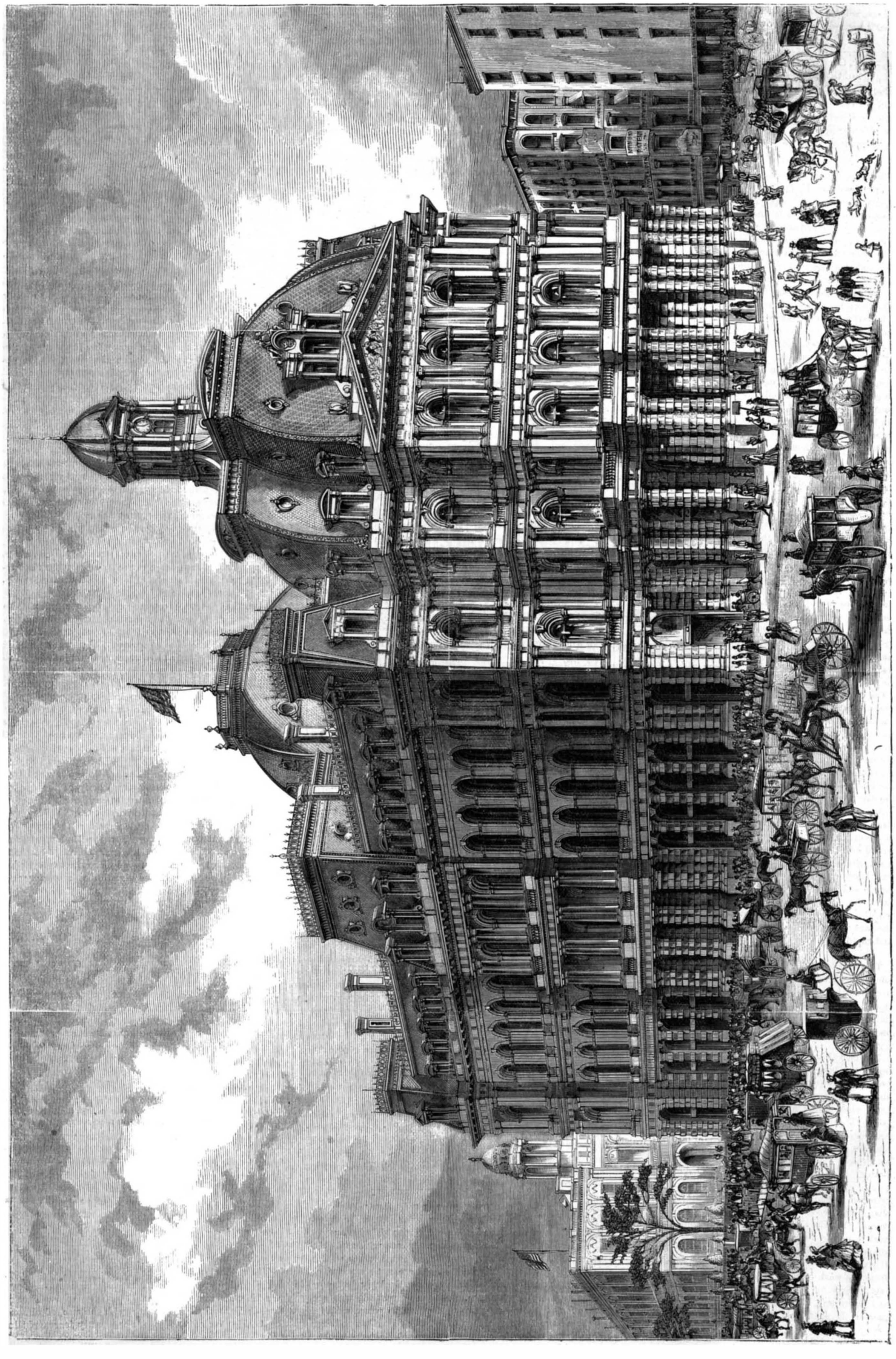

THE NEW CITY POST OFFICE.—See Next Page.

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THE CHICAGO WATER WORKS AS THEY APPEARED BEFORE THE LATE FIRE.

This building, which was, before its destruction, entitled to be considered one of the representative buildings of Chicago, has acquired renewed interest from its connection with the recent catastrophe, and we herewith append an engraving of it.

As our readers are aware, the city supply of water was drawn through a conduit from the lake, the water being taken two miles from the shore. Previous to the construction of these works, the water supply had been of inferior quality. Their completion furnished an abundance of pure, wholesome water to all parts of the city.

In all their appointments these works were as complete as any in existence, and were the pride of the city.

THE LAKE TUNNEL.

The plan of tunneling two miles under the bed of the lake was proposed by E. F. Chesbrough, Esq., the city engineer, and was executed under his superintendence. It is one of the most novel, successful, and economically executed engineering enterprises of the time.

THE PROGRESS OF THE WORK.

Ground was first broken for the work on the 17th of March, 1864, when the construction formally commenced. The iron cylinders, which had been ordered to protect the land shaft against the influx of the very wet sand and gravel known to overlie the clay for about twenty feet, did not arrive till after two months of detention. The progress at first was much slower than was anticipated, owing to the troublesome nature of the sand and gravel; but the hard clay was reached about the first of April, and the iron cylinders had been sunk through the sand. No serious difficulty afterward arose in the prosecution of the land shaft and shore end of the work. At the end of the year the tunnel had been finished from the land shaft out under the lake 2,139 feet, and July 10, 1865, it had reached 3,023 feet, and was extending outward at the rate of about twelve feet per day. August 25 it had reached a distance of 3,505 feet, and the masonry was about twenty-five feet behind the face. In some places an average rate of progress of fourteen feet per day was made for a week at a time, but for the whole period this average was considerably less, owing to occasional interruptions from the breakage of machinery, strikes among the workmen, the meeting with and occasional explosion of gas, and other causes. The average for the year ending April 1, 1865, was thereby reduced to nine and one tenth feet per day.

The back filling between the regular brick work and the irregular surface of the excavation of the tunnel, which was originally intended to be of well packed earth, was made of masonry, because it was found very difficult to get the puddled clay used, faithfully packed into the spaces. The ground generally was so uniform and favorable for excavation that the tunnel was cut with great precision, and an average of one inch thickness of cement mortar between the bricks and the clay walls was all that was required.

A tendency in the clay to swell was found at an early stage of the work, but the masonry resisted it perfectly. It, however, gave some trouble in the grading, for one portion would swell more than another. In order to facilitate the work, chambers and turn tables were placed at intervals of one thousand feet. These were used for the storage of materials and for mixing cement, and for turn-out tracks for the cars. As the work progressed iron rails were substituted for wood in the tram ways, and small mules were used to draw the cars instead of men. By all these facilities the economy and rapidity of execution of the work were increased.

VENTILATION.

The ventilation of the first half mile of the tunnel was effected by drawing the vitiated air out through a pipe connected with the chimney of the boiler furnace, but toward the last this method was found to be so ineffectual and unreliable that it was abandoned, and one of Alden's blowers was used with complete success.

PLACING THE CRIB.

The crib through which access was to be obtained to the bed of the lake for the excavation of the tunnel from that point shoreward, simultaneously with the progress of the shore end, was not placed in position before the 25th of July, 1865, when it was launched and towed out to its place in the lake. The work of sinking was delayed somewhat, in consequence of defective arrangement of and accidents to the anchors. Just as it reached the bottom a storm came on, and as the crib was not sufficiently loaded to rest firmly upon the bottom, it was filled with water, by means of a wrecking pump. After the storm had subsided, it was found that the crib had moved thirteen feet north of its true position, and that it had become firmly imbedded in the clay of the bottom of the lake. It was therefore deemed best not to disturb it, as the variation from the exact position was of no practical importance, and it was immediately filled with stone. It was afterward built up three feet higher, so as to be secure from the wash of the waves, and it was covered in by a building to serve for the protection of the workmen, the materials, and machinery. The seven iron cylinders making the iron part of the shaft, and sixty-three feet of it in hight, were connected together, one by one, and lowered inside of the crib, to the bottom of the lake, within the thirty feet wide open space in the centre of the crib. The gates or valves, by which the water of the lake is admitted to these cylinders, are placed near to their upper end.

After the cylinders had been placed in the right position, they were forced downward into the clay some twenty-five feet, the water being wholly excluded. The masonry was then commenced. In the meantime the engine for hoisting, and the necessary machinery, were made ready, and the bricks, cement, and other materials and supplies were collected and stored in the building, upon the top of the crib. For all these preparations a much longer time was consumed than was anticipated, and the work upon the tunnel at the end did not commence before the first of January, 1866, after which the work steadily progressed.

In commencing the lake shaft end of the tunnel, it was excavated for about sixty feet, to the eastward, in order to facilitate the alignment. The ground at the lake end was found to be very similar to that at the other, but more liable to cave in, and consequently, rather more difficult and expensive to work.

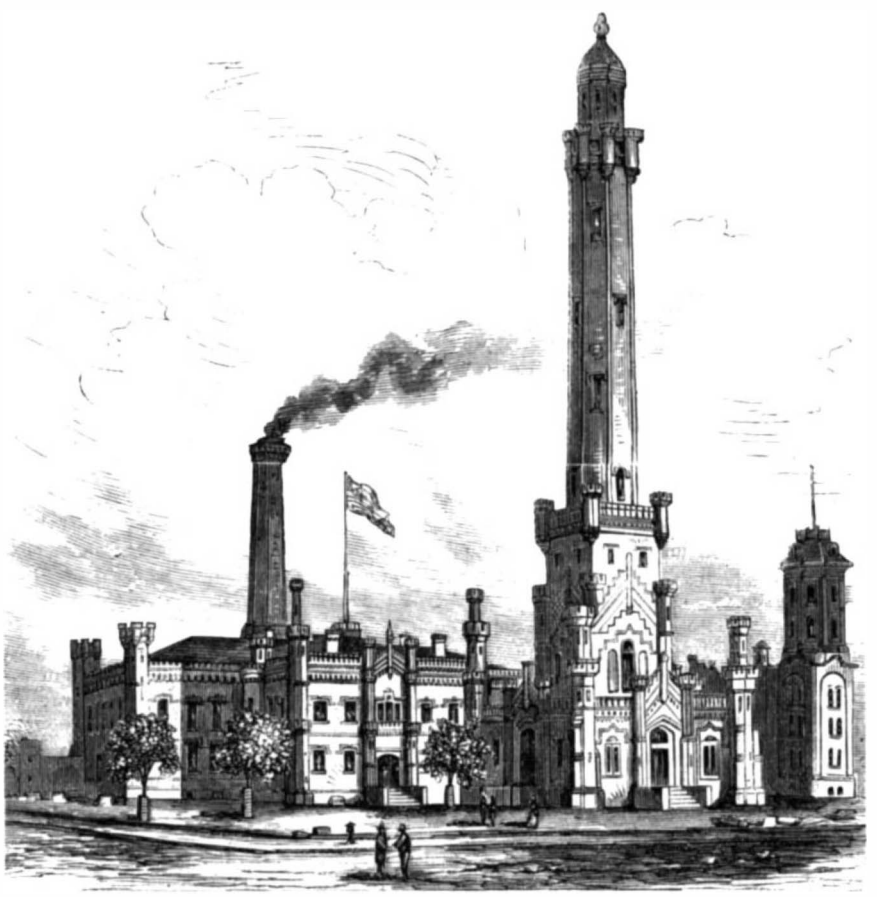
The masonry uniting the two parts of the tunnel was formally closed up December 6, 1866, by his honor Mayor Rice, and the citizens were permitted to inspect the work. There then remained the side chambers to be filled up, and the entire tunnel to be cleaned out. This was all carefully done, and the water was first let into the tunnel, from the lake, on the 8th day of March, 1867, and on the 11th it was filled to the level of the lake. The water was then pumped out sufficiently to allow a boat to pass upward of half way from the crib to the land shaft. Not a brick was found to be displaced, and it could not be perceived that the slightest fracture had anywhere taken place by the pressure to which the masonry had been subjected. As it was very desirable to use the tunnel as soon as possible, it was thought unnecessary to pump out the whole of the water, and the tunnel was again filled. The formal and public opening took place on the 25th of the month, and since that time Chicago has been free from the annoyances of impure and fetid water. The buildings for the pumping engines and water columnwere unusually commodious and beautiful, and were constructed of stone in the castellated style, from designs by W. W. Boyington, architect.

Two double acting pumps, twenty-eight inches in diameter and eight foot stroke, were used. The cylinders were forty-four inches in diameter, and their stroke the same as in the pumps. They took their water from a pump, or well, lined with brick and communicating by means of a curved tunnel with the main lake tunnel through the shore end shaft.

The following description of the burning of the building is extracted from an interesting book entitled the "Great Fires of Chicago and the West," of which the reader will find a notice in another column of the present issue:

Before tracing the progress of the fire further northward, must be mentioned the burning of the water works, and the curious, or rather incomprehensible, manner in which it caught fire almost two hours before the time that the fire first reached the north division across the main branch. As stated above, the Galena Elevator, at the edge of the main branch, caught fire from the south side at about 20 minutes to 6 o'clock. At about 20 minutes before 4 o'clock a fire was discovered in the carpenter shop of Mr. Lill, built on piles above the shallow water of the lake. Standing between the burning carpenter shop and the water works, extending northwest of the shop, stood one of Mr. Lill's book keepers. Turning round toward the water works, he exclaimed, "My God, the water works are in flames!" This gentleman states positively that the flames from the water works, when he first saw them, were issuing from the western portion of the pumping works, no flames being seen from the eastern portion of the grounds, which were occupied with coal sheds etc. On the other hand, the employés at the water works say that the fire commenced about half past 3 o'clock in the morning; that it commenced in the eastern part of the water works, which took fire from the shed. Another gentleman testifies that the carpenter shop, or the cooper shop, as he called it, was burned down before the fire commenced in the water works, and that when the water works were in full flame, the main body of Lill's brewery, with the exception of the carpenter shop, was intact. The time of the commencement of the fire in Lill's carpenter shop and the water works, however, differs one hour; the last named witness asserting that the water works commenced burning at about half past 2 or 3 o'clock. But whatever may have been the origin of the fire at the water works, it is certain that when it did commence the whole building was soon in flames, and in a few minutes the engineers had to rush out of the building to save their lives. The machinery was very considerably injured. The water tower, however, to the west of the pumping works, was almost entirely uninjured.

Our readers will find, in another column, an interesting letter referring to Holly's system of fire protection and water supply, with some remarks on the water system of Chicago, which will be interesting in this connection.



CHICAGO WATERWORKS AS THEY APPEARED BEFORE THE FIRE.

Chameleon Barometer.

M. Lenoir, of Paris, an inventor as fertile as ingenious, and who is especially known by the gas engine that bears his name, and by a system of autographic telegraphy, has just introduced a kind of barometer which at least has the merit of ingenuity. It is composed of a dial, in the centre of which is traced a circle, the diameter of which is almost half that of the dial. The annular space comprised between the two circumferences is divided into four sections; on the lower one is inscribed the name of the inventor and that of the apparatus, "*baromêtre caméléon*;" the compartment to the left is pink, and bears the inscription "much rain," the top one is gray, with the word "variable," and that on the right greenish blue, with the words "set fair." The paper in the center circle changes color according to the state of the atmosphere, conforming to the tint of one or other of the three colored compartments, according as it may be very damp, tolerably dry, or extremely dry. The apparatus is, in fact, more a hygrometer than a barometer. The change of color in the central paper is produced by atmospheric humidity. This sensitive paper is prepared with a mixture of chlorine of cobalt and of marine salts, added to glycerin to attract the humidity. Salts of cobalt, nickel, copper, etc., are largely employed in the production of sympathetic inks, with which writing or drawings can be made, invisible at ordinary temperatures, but which are made visible under a slight heat, and which disappear when the temperature falls.

THE NEW CITY POST OFFICE.

In architectural importance this building is, perhaps, only second to the Capitol at Albany, among those now projected and in process of erection on the continent. Built of granite in the most substantial manner, it is probably one of those structures that will long rank as a prominent feature of interest in the American metropolis. Our office commands a distinct view of the building and the progress of the work; and, from the general interest manifested by those who daily visit us in the course of business, we are assured that our distant readers will be glad to see the engraving of this magnificent building as it will appear when completed.

The building stands at the south end of the City Hall Park, and fronts both Broadway and Park Row.

It is built, with some modifications, in the style of the classical Italian *Renaissance*, with French roof. Three stories, in different styles of the Doric order, are placed one above another, the ornamentation increasing in richness towards the top of the building.

In plan, the structure is that of a triangle, with the apex truncated, the narrowest frontage looking down Broadway towards the Battery. In the center there is a triangular court along the main story. There will be a sub-basement, basement, and three stories, surmounted by the roof story.

On the side fronting the City Hall, there is a wide drive way, so that the building stands, and will remain, entirely isolated from contiguous structures, and may be approached from every side. A large entrance will be left at the southwest front, communicating with an ample corridor, and surmounted with a handsome portico. There will also be two other principal entrances, one at the corner pavilion on Broadway and another at the corner pavilion on Park Row. These entrances communicate with broad elliptical stairways, leading to the upper stories. Lateral entrances will also be provided on Broadway and Park Row, and to the delivery offices on the Park front.

The sub-basement and basement extend under the entire building, central court, and sidewalks. The former is lighted and ventilated through ample areas under the sidewalks and court, and will be used for the reception of fuel, heating apparatus, boiler, and steam engine. The Post Office proper will occupy the basement and principal story. The latter in-

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cludes the whole space of the building including the court. The court will be roofed with glass. The walls and partitions above this story rest on iron columns, leaving the whole space on the lower floor open for light and free communication.

A broad corridor will extend about the lower floor on the southwest, reaching to and including the central pavilions; it will surround a box and delivery screen. This corridor will be only one half story high. Above it the remainder of the story will be formed into a gallery looking inward to the delivery rooms.

Corridors encircle the building in each of the upper stories, bounded on the exterior and interior by rooms lighted from the street and central court.

The rooms of the Postmaster, Deputy Postmaster, and Cashier will be over the principal entrance at the southwest. The Park front rooms will be occupied by the United States Courts. Three court rooms will be provided, two of which will be the hight of two stories. Adjoining these rooms will be special apartments for the judges. The remainder of the second and third stories will be occupied by offices for United States Marshals and other officers, United States attorneys, clerks, and other officers connected with the courts; and the jury rooms will be in the third story.

The work has proceeded slowly owing to various obstacles, some raised by the city authorities, but it has now reached to the second story.

As our readers will see, the lower part of the building is open to the criticism that its numerous angles will form most efficient dust traps. This will inevitably impart a dingy dirty appearance, which will greatly mar the effect designed. We regret that some other design for this story, in harmony with the rest of the design, yet not liable to the objection named, was not adopted.

Barring this defect, the edifice, when completed, will present a majestic and imposing appearance.

Stone, iron, and brick are the materials used; the exterior is of granite. One hundred and fifty-nine iron columns are placed in the basement, and one hundred and seventeen to support the partition walls and floors. The foundations are of granite and concrete, and are of the most substantial character. The floors will be of brick and iron, the stairs are to be of stone and iron, the roof of iron, covered with slate and copper. The building is to be heated by four large low eprssure steam boilers.

The roofs of the corridor pavilions rise 107 feet above the sidewalk. The foundation of concrete is laid 35 feet below the sidewalk: the cellar is a little more than 7 feet in the clear, the basement 16 feet, the public corridor 14 feet, and the *mezzanine*, or gallery above, nearly the same. The outer circuit of the building will be over one fifth of a mile.

The granite comes from an island off the coast of Maine, where 600 men are employed in quarrying and dressing it. No stone cutting is done at the building. When the blocks arrive, they are ready to hoist into the places prepared for them. Derricks, worked by steam engines, are arranged in such a way that it requires only one man to set all the stone which 600 men are cutting.

The north front of the building will be 290 feet in length, the Broadway front 340 feet, and the Park Row front 320 feet in the clear. On each of these two fronts, however, there is an angle, which, running back some distance and then projecting, forms the entrance looking down Broadway. The entire width of this front is 130 feet. These entering angles and projecting portico will give this front a very bold and striking appearance.

The Doctrine of Metempsychosis.

At the time of the death of Mr. Louis Bonard, an ingenious mechanic of this city, we called attention to his bequest, to the Society for the Prevention of Cruelty to Animals, of $100,000. The testator's relatives are disputing the validity of the will on the ground of insanity, and rely partly upon the alleged belief of the deceased in the transmigration of souls. Dr. Clymer was examined as a witness, and, on being asked if he considered such a belief to be a mental delusion, replied:

"I will tell you in my own way. It appears that opinion was at one time a very common doctrine. In modern times we know it more as the doctrine of Pythagoras, but he got it from the Egyptians. Now, it is told, they were the first who believed in the immortality of the soul, and that this was the first expression of such belief. They held that the soul, being immortal, when it leaves the body, enters another, and never ceases to be removed from one to another. Metempsychosis implies the passage of that soul into animals successively, and, according to some who held the doctrine, again returning, after certain purifications by its progress through these animals, to the human form; and this was one of the reasons why the Egyptians preserved their mummies. This doctrine was held by the Druids of France, Britain and Germany, and is held by the Brahmins, and, in more modern times, by Fourier, and his disciples in France. Origen, one of the Fathers of the Church, held it, and some theologians endeavored to prove it as held in the New Testament, from the 9th chapter of St. John, and others say the doctrine of purgatory originated in this way. Our own Christian doctrines are held variously. What one believes, another thinks a delusion, but a medical man, finding no evidence of delusion generally, would not be warranted in saying such a person labors under mental delusion. The transmigration of souls was held by some of the first minds in ancient and modern times, and I do not consider a belief in it necessarily implies that he was laboring under delusion."

YOU may glean knowledge by reading, but you must separate the chaff from the wheat by thinking.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Fireproof Building.---How they Build in Berlin.

To the Editor of the Scientific American:

The late Chicago fire has called public attention to the subject of fireproof building; and within the last few weeks a number of articles about this matter have already appeared in the columns of your paper. It seems to me that all endeavors to find constructions which will be really fireproof—for instance, so as to stand a fire like the one in Chicago—are useless, at least as far as the majority of our buildings are concerned, for the simple reason that even if such constructions were found, they would be too expensive for our ordinary dwellings, stores, etc. If stones, bricks, and iron are considered insufficiently fireproof, we may give up the idea of building our cities of fireproof houses. The proper remedy to prevent large conflagrations is to build all houses in a city as fireproof as can be done at a reasonable cost. If only all frame buildings, as well as the unnecessary use of wood for inside work, roofs, etc., were absolutely prohibited, and no lumber yards and the like were allowed inside of our cities, the houses need only be built substantially of stone brick, and iron, and we should have no more conflagrations of any extent. In most of our cities, however, the building laws are, or at least have been up to a recent date, of such a deplorable nature, and a mode of building has accordingly been in use, that a fire can hardly be expected to remain confined to the house in which it originates. As long as party walls are allowed, and chimneys are built without any foundation, but supported only by a couple of joists, etc., etc., our houses will always be apt to communicate a fire from one to the other, as, as soon as a whole row of houses is in flames, the heat is sufficiently intense to set fire to adjoining buildings, even if they are built independent of the former.

An example that it is not necessary to build a city of fireproof buildings only, to prevent any large fires, is the city of Berlin. There has been no fire of any extent during the last ten years, the mere reason of which is an excellent building law and a strict enforcement of the same, in combination with an effective fire department.

In this country, however, even where more money is spent on a house than is necessary to construct it fireproof to a certain extent, we often find that a great deal of money is expended in such a manner as to make the building as unsafe as possible against fire. We will only allude to the "lumber piles" which are put on many houses, in the form of "French roofs." Our stores and offices are lined with neatly dressed lumber, which, to make it the more dangerous, is oiled or varnished. Is it a wonder if a safe in such an office proves insufficient to preserve its contents in case the building takes fire? Such unreasonable use of wood for the inner outfit of our houses should not be tolerated, in the same way as, in most of our cities, shingle roofs are now prohibited by law. For the majority of our buildings, lumber cannot be entirely excluded as building material, as for floors, joists, rafters, etc.; but its use should be diminished as much as possible; wooden partitions should be abandoned, and the stairways should be made either of iron or stone, and self supporting, so as to require no casing, a construction which cannot be too highly recommended.

I have been in Berlin for four years, from 1862 to 1866, and I do not recollect ever to have seen a fire there. I have often seen the engines in position, ready to go to work, but in almost all cases the fire was suppressed without bringing them into use. How does this compare with the fires in our American cities, where in one half of the cases the damage done by water is greater than that by fire?

Baltimore, Md. H. DUEBERG.

An Appeal to Dr. Vander Weyde.

To the Editor of the Scientific American:

Professor P. H. Vander Weyde, in one of his very interesting articles upon psychic force, speaks of the Davenport brothers, and how that he had performed the same wonderful feats as those jugglers. Now, as they have astonished and excited the wonder of large audiences in nearly every city in the United States, the Professor would confer a favor upon thousands, perhaps hundreds of thousands, of his fellow citizens, if he would give a clear and full *exposé* of the wonderful performances of those men while in their cabinet; such as the taking off of the coat of one of them, while securely tied, and the knots sealed with sealing wax; also the putting on of another gentleman's coat while he (the Davenport) was tied fast to a chair. Of course the light was extinguished during the performance, but not longer than it would have taken a man, not tied, to put on or take off his coat. And will the Doctor also explain the passing of the musical instruments around the hall, with phosphorus on them to enable the audience to see their movements?

Americus, Ga. J. FRICKER.

Squeaking Boots Again.

To the Editor of the Scientific American:

I have two pair of calfskin boots, both inveterate squeakers, which I have worn for a year. I tried all the known remedies, as greasing the soles, driving in pegs and nails, soaking them in water and wearing them till dry, but without success. At length a happy thought struck me. With a rag, I saturated the insoles with kerosene oil; and *Eureka et* glory! O hallelujah! the thinnest pair gave in at once, and the other pair after the second application.

Sextons and ushers will please make a note of this, and ever cherish, with grateful remembrance, the name of the discoverer, JONES.

[For the Scientific American.]

ABSORPTION OF MOISTURE BY BRICK AND STONE.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY UNIVERSITY MEDICAL COLLEGE, NEW YORK.

In the construction of buildings in a climate like ours, it is of tho utmost importance that the materials employed should absorb and retain as little water as possible, otherwise the buildings will be damp, and the presence of quantities of moisture in their walls will favor the formation of vegetable growths upon their surfaces, which will, together with the action of frost, aid materially in the process of disintegration.

In a recent experimental investigation of this subject, I selected the following materials, namely, brown stone and Nova Scotia stone of the best quality, fine red Philadelphia brick, and a very compact, hard burned, white brick, stamped A. Hall & Sons, Perth Amboy, N. J. Masses of equal size of each were placed in water for twenty hours to allow them to imbibe as much of the fluid as they could take up. They were then turned about on blotting paper as long as they dampened it. The external moisture being thus removed, the masses were weighed and placed in an air bath at 212° for three hours. On being removed from the bath, they were put under a glass bell jar, and, being again weighed when cool, were found to have lost the following quantities of moisture.

TABLE I.

Brown stone	10,000	parts, lost	260	of moisture.
Nova Scotia stone	"	"	426	"
Red brick	"	"	1,179	"
White brick	"	"	525	"

The masses were then placed in the warm air bath again, and kept at 212° for four hours. On being cooled with the same precautions as before they showed the following losses:

TABLE II.

Brown stone	10,000	parts, lost	8	parts	of moisture.
Nova Scotia stone	"	"	8	"	"
Red brick	"	"	0	"	"
White brick	"	"	0	"	"

The masses were then placed on an iron plate, which was heated to a dull red heat and covered with a hood of tin to cut off currents of air. They were consequently exposed to a uniform temperature, which was sufficiently high to scorch paper when it was laid on their upper surfaces. The last traces of water were thus expelled, the quantities being as follows:

TABLE III.

Brown stone	10,000	parts, lost	17	parts	of moisture.
Nova Scotia stone	"	"	35	"	"
Red brick	"	"	a trace		
White brick	"	"	a trace		

The conditions, to which the substances were submitted at the commencement of these experiments on drying, may be regarded as representing their state after a prolonged storm of rain in which they had been drenched and soaked with water for many hours, and Table I. demonstrates that while the brick absorbed more moisture than the stone, the white brick imbibed less than half that taken up by the red, and the brown stone a little more than half that taken up by the Nova Scotia stone.

Table II. in its turn shows that stone is far more retentive of its moisture than brick, for, while the former lost eight parts, the latter lost none. In Table III. the same fact is still more conclusively demonstrated, for against an almost imperceptible loss on the part of the brick, the brown stone lost seventeen parts, and the Nova Scotia stone, thirty five. We are therefore justified in concluding that though brick absorbs a larger quantity of moisture than stone, it is to be preferred as a building material, since it parts with the imbibed water with greater facility; and, comparing the two kinds of brick together, the white hard burned brick is superior to the red, since it absorbs only half as much water.

Passing from the consideration of the power of retention to that of absorption, I found that, on submitting the thoroughly dried masses of the last detailed experiment to the action of an atmosphere saturated with moisture at 70° Fahr. for six days, the following results were obtained:

TABLE IV.

Brown stone,	10,000	parts, absorb	at	70°,	52	of moisture.
Nova Scotia stone,	"	"	"	"	45	"
Red brick,	"	"	"	"	3	"
White brick,	"	"	"	"	3	"

The conditions prevailing in this experiment may be regarded as being similar to those existing on an ordinary midsummer day when the dew point stands at 70°; and on inspecting the table we find that, while the brick absorbs but little moisture, the stone is very hygroscopic, the brown stone possessing this property in a more marked degree than the Nova Scotia. Since warmth and moisture, taken together, are peculiarly favorable to the production of vegetable growths, it follows that brown stone is, by virtue of the larger amount of water it absorbs, more liable to disintegration from this cause than the other substances submitted to experiment. In the case of the bricks the absorptive power is, as the table shows, equal, and very slight or slow in its action. They are therefore superior to stone in this respect.

To determine the absorptive power when exposed to conditions similar to those prevailing during a fog, I caused steam from a free opening to play upon them for three hours. After cooling for twenty hours, they were weighed with the following result:

TABLE V.

Brown stone,	10,000	parts, absorbed	147	parts	of moisture.
Nova Scotia stone.	"	"	110	"	"
Red brick	"	"	127	"	"
White brick	"	"	106	"	"

Which demonstrates that under such circumstances brown stone is more hygroscopic than Nova Scotia stone, and there

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fore affords a more favorable *nidus* for vegetable growths, and is consequently less durable. In the case of the bricks, though the red brick absorbs more fog than the Nova Scotia stone, it is a better building material, since it surrenders its moisture with greater facility. The white brick, on the contrary, absorbs less fog than the others, and dries as easily as the red brick; it is therefore the most satisfactory of the building materials submitted to examination.

JOHN C. DRAPER.

[For the Scientific American.]

SOME REMARKS ON PROFESSOR CROOKES' LATEST COMMUNICATIONS.

BY P. H. VANDER WEYDE.

By the kindness of Professor Morton, of Hoboken, I had been furnished the advanced sheet of Professor Crookes' second article, of which an extract appeared in the SCIENTIFIC AMERICAN of November 11th. I was thus perfectly informed of Professor Crookes' latest arguments when I wrote my reply, to certain defenders of the psychic force, published in that same number. I mention this fact only as proof of my quiet convictions of being in the right. I did not refer to it, intending to dispose, in the future, of this somewhat new phase of the subject, and, for shortness' sake, I confined myself to that which had, so far, been brought before the readers of this paper.

As the main points of Professor Crookes' new paper have now appeared, and perhaps been digested by the readers of the SCIENTIFIC AMERICAN, I will consider them in detail, not that I personally consider the subject of such importance, but because the doctrine of the psychic force finds many adherents, whom I think it a duty to save from this novel form of superstition, if such a thing be possible.

Professor Crookes begins with using, as a motto, a quotation from Galvani, in which the latter says that, notwithstanding he is derided by scientists and know-nothings, he knows that he has "discovered one of the greatest forces in Nature." Now this quotation may seem applicable to Professor Crookes, but there are some curious differences and resemblances, which I will first notice. Professor Crookes cannot complain that also the know-nothings laugh at him; they almost all believe in the psychic force, only the great majority of the scientists are incredulous. This is a difference. A resemblance is in the fact that Galvani supposed he had discovered a vital force, a nervous fluid, in short the psychic force, and he attacked Volta and others, most violently, for trying to prove that the contact of the different metals developed an electric current, which caused the motion of the frog's legs, because the latter are, in fact, nothing but a delicate electrometer. Galvani died in the conviction that the cause which moves the frog's legs resides in the frog, and that Volta was in error to ascribe it to an exterior cause; and so Professor Crookes appears convinced that the cause which moves the spring balance resides in Mr. Home, and that others are in error who ascribe it to exterior causes. It has been recorded in the history of scientific discoveries that if Galvani had been posted in electrical science, he would have attributed the first accidental observation of the motion of the frog's legs to its true cause, the induction by the electrical machine, which was being operated at the time in the same room; but being ignorant of the laws of induction, notwithstanding these laws, at that time, were well known and established, he fell back on his old cherished hypothesis that all animals have a peculiar force residing in them; and he was so far from discovering the true theory of these electrical actions, that many well informed scientists, among them Professor B. Silliman, of New Haven, rightly object to the use of the word galvanism, on the ground that Galvani never discovered that which we now designate by that name. It is therefore proposed that Voltaic battery and Voltaic current are the true expressions to be used, and ought to supersede those now in use, which give to Galvani an honor that by no means belongs to him.

The objection was made to Professor Crookes, of rushing into print soon after having made the announcement a short time before of his intention to investigate Home's performances. Professor Crookes answers now that, within two years, he has witnessed experiments of this kind, and that he saw weights of 40 or 60 lbs. so powerfully psychologized that he and others present could scarcely lift them from the floor; that he also saw the gravitation diminished, etc. By this Professor Crookes confesses that he was already a convert to the belief in so called psychological phenomena, and prejudiced in their favor at the time that he announced that he was going to investigate Home's performances.

In regard to the increase in weight of so called psychologized substances, I can speak with full knowledge, having myself often seen such performances; and I must declare that this increase is all in the imagination of the persons trying to lift the weights; their minds were psychologized, that is, so influenced by imaginative persuasion, that their muscles were partially paralyzed. As my faith in the constancy of the laws of gravitation cannot be shaken, my mind could not become psychologized in this way, and I had never any trouble in lifting the weights, and never found any difference whatever, even when a dozen people assured one another they were much heavier than before. However, the best proof I had was to place such a mass in the balance, and challenge the mediums to increase its weight a single ounce; no one ever succeeded in doing this. They pretended to be able to increase or diminish weight, and were sustained by the assertion of many present, but their assertions were never sustained by that most reliable tool of the scientist, the balance.

And this last mentioned peculiarity of the balance must be the crucial task for the reality of the pretended psychic force. The microscope and telescope have often deceived me, the spectroscope is giving me desperate problems to solve, but the balance is the most precious apparatus in my possession, because it always gives direct answers, and has never deceived me. Now, Professor Crookes, as chemist, has surely at least one reliable balance, decidedly more delicate than any existing spring balance; therefore it is surprising that he does not let Home exert his powers on the weights placed in the same, in place of using spring balances, which are so peculiarly apt to be used for deception, that some traders use them exclusively, and in some European countries their empioyment has been most peremptorily prohibited. In this way he may not only positively prove the existence of the psychic force, but correctly weigh the amount of it to within the tenth of a milligramme; with the balance he may more easily find through what substances this pretended force is conducted; and determine what are conductors and non-conductors of this force or vital fluid, as already appears to have been done in England, by Ziegher, who, six years ago, patented a battery to develop this vital force in large quantity. I am surprised that Professor Crookes is not aware of this important discovery, which is just in the line of pursuit he has now entered upon. He will find it easily in the English patent office records. Mr. Ziegher asserts that it is not electricity, as it passes through bodies which do not conduct electricity, silk being its best conductor. It may be developed independently of the human body, whenever a nitrogenized substance comes in contact with a carbonized body. To produce it he takes a number of bladders filled with liquid ammonia (the nitrogenized substance), and places them in vessels containing molasses (the carbonized substance); these bladders and vessels are connected like a voltaic battery, but by means of silk cords, around the necks of the bladders and hanging in the molasses, in this way: ammonia, bladder, molasses, silk cord, ammonia, bladder, molasses, silk cord, etc.; when now the extreme silk cords are joined, the current of psychic force, or vital fluid, is established, and men or animals placed in this circuit become very lively. This is no exaggeration, as I give the inventor's and English patentee's own words.

In regard to the principal experiments described by Professor Crookes, I will state that I have now arranged the very same contrivance, and am anxious to find a medium who can move it; but I desire psychic action on my chemical balance, produced without contact, to convince me, and then I will as readily reject my old notions, as I have rejected my former errors, which were to believe in the existence of a luminous, a caloric, a magnetic and an electric fluid.

Benefits of Co-operation.

There seems, says the *Nation*, to be a mischievous notion growing up in the minds of some of the European Governments that the International can, and ought to be, put down by force. An attempt of this kind is probably the only thing that could make it permanently powerful and dangerous. But its existence is a symptom, and a striking one, of the tendency of all political questions everywhere to merge themselves in the labor question, and the main result of the work of the International will probably be the rooting in the working class mind all over Europe that this is really the only political question of any moment. A statement was made by Mr. Nutall, a well known leader of the co-operative movement in England, at a recent meeting of the British Social Science Association, revealing a prospect for the laboring classes which makes the schemes of the International and of the "Labor Reformers" very unimportant. He showed that in the manufacturing borough of Oldham, with a total population of seventy thousand, there were co-operative societies numbering seven thousand members. They had a capital of eight hundred thousand dollars in their six co-operative stores, and a hundred and fifty thousand dollars invested in other places. They had built seventy-five workingmen's houses in the last twelve months. They have a corn-mill, large halls, and five libraries, and consultation rooms where they meet weekly for discussion. They have a capital of fifteen hundred thousand dollars, invested in cotton mills and loans; and in one of these cotton mills, which represents a capital of half a million of dollars nine tenths of the shareholders are workmen. A good question for our "labor reform" conventions to discuss would be, how many years of perorating and gadding about the country it would take to produce such results as these.

How to prevent Water from Freezing.

Boussingault relates the following experiment, conducted by him in order to test the condition of water, when cooled considerably below its normal freezing point, under circumstances where free expansion was prevented. For this purpose, a strong cylinder of steel was filled with water at the temperature of maximum density, and a steel plug tightly fitted to the opening, thus preventing, by the strength and the practically unyielding nature of the confining vessel, any expansion of the contained liquid when cooled. The sound made by the falling of a metal ball, previously placed within the cylinder, gave an indication of the condition of its contents. Under these circumstances, Boussingault found that water remains liquid even at a temperature of —18° C. (—0·4° Fahr.), but freezes instantly as soon as the plug, which hermetically sealed the vessel, is removed and the particles are allowed full freedom to expand.

WE hear from Russia that a commission, empowered especially for the consideration of the subject, has recommended the adoption of a narrow gage on the system of railroads about to be constructed between Orenburg and the Caucasus.

Butter Making.

Fine butter is made in various ways; and it would be a public benefit if a uniform rule could be discovered and followed by all in the manufacture of butter. However, this would not render all butter of the same quality, so long as the quality of milk is so different. Breeds of cows, different grasses and other feed, will always continue the difference in milk. Hence we may always expect to find upon the market the different grades of butter usually quoted. The three following modes of caring for milk are principally followed in this State:

1. The milk is strained into pans and set on racks or shelves in the milk room.

2. The milk is strained, and set in pails, in which a small quantity of sour buttermilk is put, to hasten the souring of the milk. When this is sufficiently effected, the milk is churned.

3. In the creameries and many of the large dairies, the milk is strained into pails, about eight inches on the bottom and not far from twenty inches high. These pails are then set into vats differently constructed, into which flows a stream of cold water, which is allowed to rise nearly to the top of the pail and then flows out of the vat, so that there is a constant flow of cold water around the pails. Twenty-four to forty-eight hours is a sufficient time for the cream to rise. It is then dipped off, the cream allowed to stand until slightly sour, and churned. The same process is substantially followed by those who use the large square pan and adopt the cooler system.

Good butter may be made by either of the above modes of handling the milk. But in either case great cleanliness and care are to be observed. Where the pan system is in vogue, the milk room should be so constructed as to admit free ventilation, regulation of temperature, and light. Direct sunlight should never fall upon the milk; neither should a brisk current of air pass over it. Both rapidly dry the cream upon the surface, and convert the surface into a tough, skinny substance, which cannot be converted into good butter.

The cream should be taken off the milk, so soon as the milk is changed or slightly sour. It should never be suffered to remain until spots of mold appear on its surface and whey arises at the side of the pan. Great care should be taken to prevent any bad air to reach the milk room, as both milk and cream rapidly absorb bad air; and where it prevails, good butter cannot be made. The old-fashioned dash churn in some size is best. Churning should be done done slowly, not over forty to sixty strokes per minute; and the milk or cream should be brought to a temperature varying but a little from 62° Fahr. Churning should be thoroughly done. The butter should not be removed from the churn until it is completely "gathered." It should be worked into a solid mass in the churn by the use of the dash; so that, when taken out, there will remain but a small quantity of buttermilk to be worked out. A large majority of dairymen wash their butter, and it is the best practice if you have soft water. Butter should be worked by pressure, whether it be done with the hand ladle or any kind of butter worker. The washing and working should be continued until all the buttermilk is removed. The butter should then be salted. For every twenty pounds of butter, use one pound of sifted, fine dairy salt. Work it carefully and evenly into the butter, and pack immediately.

The practice of salting butter and letting it stand from twelve to twenty-four hours, and then working over and packing, is not only unnecessary, but damaging to the quality of the article. "What is once done well and properly done, is better than twice ill done," applies in this case. The second working renders the butter "salvy." It breaks down the "grain" of the butter—and fits it for grease. Those who have practiced the above mode of working and salting their butter will not go back to the old mode. They say it is the only way they can put down their dairy and feel sure it will come out all right at the end of the season.—*Chenango (N. Y.) Republican.*

Transparent Varnishes.

The aniline colors are particularly well adapted for the manufacture of transparent lacs, which possess great intensity even in very thin films, and are hence very suitable for coloring glass or mica.

The process recommended by F. Springmuhl is to prepare separately an alcoholic solution of bleached shellac or sandarach and a concentrated alcoholic solution of the coloring matter, which last is added to the lac before using it, the glass or mica to be coated being slightly warmed. Colored films of great beauty may also be obtained, according to the author, from colored solutions of gun cotton in ether, the coloring matter being here dissolved in alcohol and ether.

The collodion film has its elasticity greatly increased by the addition of some turpentine oil; and when applied cold, can be removed entire. The colored films may now be cut into any pattern, and again attached to transparent objects.

THE much praised plant *Cundurango* and its juice have already fallen upon evil times. Violently attacked by many members of the profession as a worthless nostrum, the owners are apparently attempting to maintain its character as a quack remedy by offering it to sufferers at $100 per pound, C. O, D., no quantity less than one quarter of a pound being sold. This is making the most of the present notoriety of the drug, and looks as if the proprietors were not anxious for time to extend and justify its reputation.

WHERE manufactures flourish, land and its products are most valuable.

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Improved Portable Steam Engine.

We illustrate, in the accompanying engraving, R. Tozer's portable steam engine, to which gold medals were awarded by the South Carolina Agricultural and Mechanical Society, and which embraces in its design many features of merit that well adapt it to the uses to which portable engines are generally applied.

The cylinder is cast in the center of the steam dome, thus avoiding the use of an induction pipe. A hole is cut in the top of the boiler, which admits steam to the dome, the live steam being thus made to entirely surround the cylinder and steam chest, keeping the cylinder hot and preventing condensation therein.

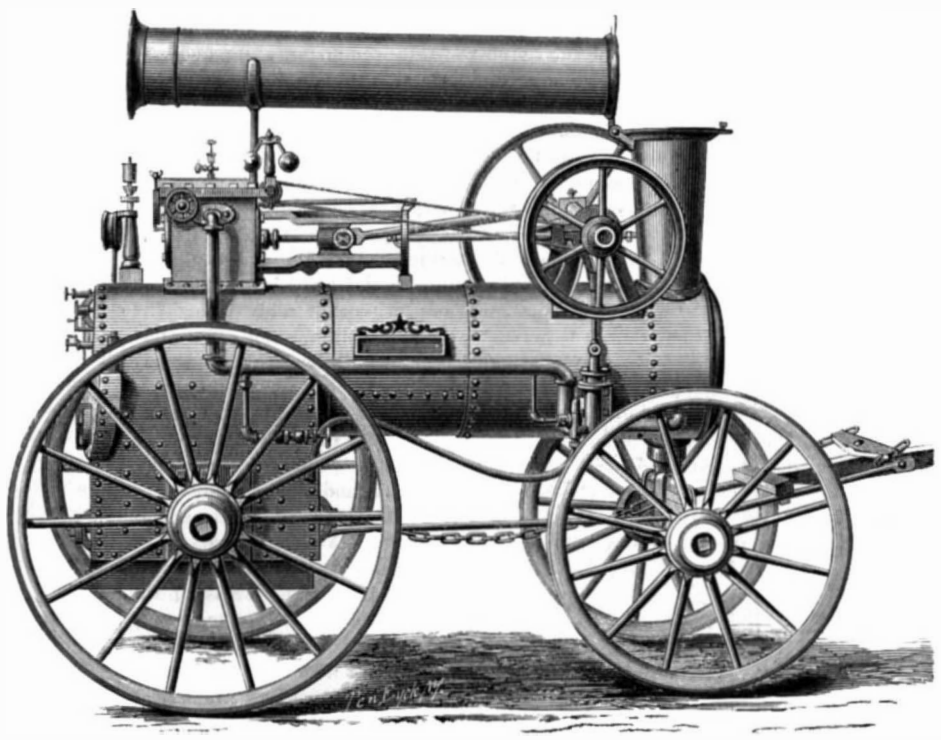
A valve on the side of the steam chest admits the steam to the cylinder, and a plain cover covers both dome and steam chest.

The guides are cast in front of the dome, and bored out with the cylinder.

All parts of the engine are easily accessible, and it is very neat and compact in appearance.

It is stated to operate with great economy, and, having a long connecting rod, it works very easily in its guides.

The engine was designed by R. Tozer, of Columbia, S. C., who manufactures engines of this class, of from four to twenty horse power, and from whom further information may be obtained.



TOZER'S PORTABLE STEAM ENGINE.

Novel Use for Worthless Safes.

The Chicago *Tribune* suggests the erection, in that city, upon the Ball Grounds, of an immense monument to the memory of a number of worthless institutions, late of that city, among which are the various fire insurance companies that proved good for nothing in the hour of trial, the fire-proof safe builders, whose wares failed at the critical moment, the police and fire departments, so sadly deficient in the time of need, etc. Says our cotemporary:

"All over the burnt district the prostrate forms of hundreds of conquered safes are lying, where, having faithfully performed their duties as worthless guardians of property, their ungrateful owners have abandoned them to ignominy. The idea of building a monument from them is novel and unique—more so, perhaps, than the monument itself will be, but we must not grumble at appearances. Henceforth the whole duty of our citizens will be to build every structure cheaply, fireproof, and without regard to appearance. Now, as these safes are utterly worthless—as they always were, only their gulled owners did not know it—the monument will be the cheapest possible. As they have already been subjected to a fierce heat, and have been thoroughly burnt to rubbish, there is little fear that they will burn again. It is true they are of all sizes, patterns, and qualities of badness, and makers and owners will all have a proprietary interest in the structure."

A REMARKABLE BOY MECHANIC.

We have on our table a complete working model of a horizontal steam engine with tubular boiler of the locomotive type, separate from the boiler, the workmanship of which would do credit to an experienced mechanic. Every part is stated to have been made by Master C. T. Mason (at the age of fourteen years), of Sumter, S. C. Nothing is omitted, even a miniature steam gage being supplied. Master Mason will, if he continues to progress, be a master mechanic at an age when boys in general have scarcely an idea beyond tops and marbles. He will please accept our thanks for sending his engine for our inspection, and our predictions that, if he lives, he will occupy a distinguished place among the engineers of this country. Few men could beat the execution displayed in his working miniature engine, which, in its details, indicates a knowledge of steam and the laws of its action most remarkable in such a youth. Let Master Mason apply himself diligently to the study of mathematics, mechanics, and drawing, and there can be no doubt of his future. We may add that this young mechanic received a silver medal as a first premium on this model, from the Agricultural and Mechanical Society of South Carolina at its fair of 1869.

Merriam and Dietrick's Lime Kiln.

This invention has for its object to furnish an improved lime kiln, simple in construction, conveniently operated and controlled, and effective in operation, and which will allow the lime to be drawn off as burned, and from the front, side, or rear parts of the flue as may be desired; and it consists in the construction and combination of the various parts of the kiln, as hereinafter more fully described.

The lower part or draw of this kiln, which is built of stone, is about ten feet long, four feet wide, and four feet high. An inclined grate or rack is placed in the rear part of the draw to receive the lime as it falls from the flue. Two heavy plates of cast iron are made with openings in their centers, and placed above the draw and one above the other, at such a distance apart as to receive between them sliding grates or bottoms. The space between these plates is left open at the front and rear, to allow the sliding bottoms to be slid out in front or rear, and one at a time or together, to draw the lime from any desired part of the stack. Sliding dampers are secured to the sliding bottoms in such a way that they may be moved laterally, to partially or wholly enable the draft to be regulated and the fire to be controlled, as may be desired. The stack is of brick, about twenty-four feet high and has a door, in the lower part at the front, through which the lime may be drawn. Either coke or coal may be used in the kiln as fuel, but coke is preferred, as being better and cheaper.

In charging the kiln, about a quarter of a cord of dry wood is put upon the bottom, upon which is placed a layer, about one foot thick, of limestone, then a layer about three inches thick of coal, and similar layers of stone and coal alternately until the flue is filled. The fire is then applied to the wood, and, after being lighted about twenty-four hours, will have burned about ten or twelve feet above the bottom, which becomes cool. As fast as the lime is burned, it is removed and alternate layers of coal and stone added, so that the kiln may be kept burning continuously.

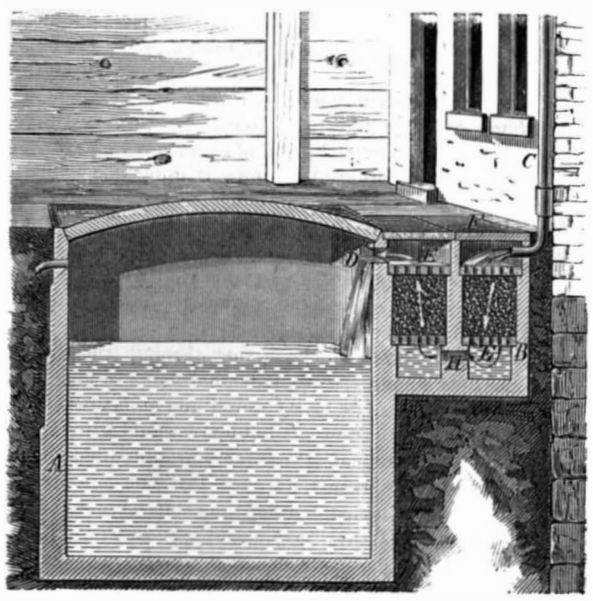
This kiln is the invention of John Q. Merriam and Abram J. Dietrick, of Fort Scott, Kansas

SIMONSON'S IMPROVED FILTERING CISTERN.

Mr. John Q. Simonson, of Graniteville, Staten Island, is the inventor of the improved filtering cistern illustrated in the accompanying engraving.

He claims, as the advantage secured by his invention, that by its use, a perfect substitute for wells is obtained at less cost, while supplying purer water.

The filter is a double one, so that the water is really filtered twice before passing into the cistern for use. It has, we are informed, been on trial for more than three years, preventing any dirt or sediment from being deposited in the cistern. It being an outside attachment, it is easily cleaned out by any ordinary laboring man, and can be quickly re-arranged for use without disturbing the water in the cistern.



The parts, lettered for reference in the engraving, are as follows:

The walls of the cistern are represented at A, the walls of the filter at B, the spout leading from the roof at C, and the exit from the filter to the cistern at D.

Perforated tiles, E, rest upon offsets in the walls of the filter, as shown. The lower tiles are placed sufficiently above the bottom to form chambers, shown separated by a middle partition, these chambers communicating with each other by openings, H. Similar chambers, which do not communicate with each other, are formed above the upper tiles.

The filtering material is placed in the two filtering chambers between the upper and lower tiles, which chambers are also separated by the middle partition.

This filtering material may be one fifth gravel and four fifths charcoal, or it may be all charcoal, or any suitable material preferred.

The flow of the water, as indicated by the arrows, is first into one upper chamber, where it falls upon the perforated tile, which breaks the stream into many small ones, thence it passes slowly down through the filtering material into one of the lower chambers, and from this into the other lower chamber through the openings, H, thence slowly upward through the second filtering chamber into the upper chamber nearest the cistern, out of which it passes into the cistern, purified and ready for use.

In passing slowly through the lower chambers of the filter, the water flows from one to the other through the apertures, H, as described; but as these apertures are at considerable distance from the bottom, there are formed pockets on each side of the middle wall, which serve to collect and retain materials that escape the action of the first filter. The lightest will be retained in the second of these chambers, in which the water ascends with a very slow and gentle movement.

The invention was patented Sept. 10, 1871. For further particulars address Benedict Brothers, 171 Broadway, New York.

The Artificial Volcano.

Dr. Fred. V. Hochstetter furnishes an interesting account of a phenomenon occurring during one of the phases of a manufacturing operation, which is, as he claims, a complete duplicate, upon a miniature scale, of a volcanic eruption, and which serves, at the same time, to confirm the modern views concerning the process of an eruption; according to which the lava is not simply in a molten condition, but is reduced to the state of liquidity by the action of superheated water vapor under great pressure.

The phenomenon referred to occurs in the operation of separating the sulphur from the residual products obtained in the manufacture of soda by Leblanc's process. The sulphur obtained from these residues, in order to free it from the gypsum or sulphate of lime mixed with it, is melted in a suitable apparatus, with steam under a pressure of from 2—3 atmospheres. The gypsum remains suspended in the water, and the fused sulphur is from time to time run off into wooden troughs or forms, the temperature of the fluid mass being about 122° C. (251·6° F.) Almost instantly after the pouring, a crust of solid sulphur is formed on the surface of the mass. Dotted over this surface, however, the orifices are left, from which the liquid beneath is forced up. At intervals a jet of sulphur bubbles out, and cooling, forms around the orifice a slight prominence; the repeated eruptions accumulate material about it, until a miniature volcanic cone is formed, with its crater well defined.

The cause of this curious phenomenon is found in the fact that the sulphur, in its fused condition in the steam chamber, takes up and retains a certain quantity of water; and this absorbed water, it appears, is given out gradually in the in the form of steam, as the sulphur solidifies. The slowly liberated steam, accumulating pressure beneath the crust of sulphur, forces, at regular intervals, an outlet at the vents, carrying with it in its passage the molten material to form the solid cone.

QUINNIPIAC DAM.

The town of Wallingford, Conn., by the almost unanimous voice of its voters, has pledged its co-operation with the community of that place, in the erection of a large dam across the Quinnipiac river, in Wallingford. A three hundred horse power will thus be formed, adding materially, it is believed, to the prosperity of the town.

The Wallingford Community is an association comprising about forty-five members, whose religion and social practices are similar to those of the Oneida (N. Y.) Community. At the discussion of the project in town meeting at Wallingford, while all admitted the material benefits to be derived from the establishment of the water power, objection was made to its consummation on moral grounds. It was alleged that the men and women composing the community were simply a parcel of whoremongers and harlots, to associate with whom, in building the dam, would be a disgrace to the town; and it was asked, now that the Government was endeavoring to extirpate polygamy from Utah, why should not Wallingford rather discourage than encourage the existence in their midst of an association of persons like the Wallingford Community?

This view was promptly rejected by the majority, as having no bearing on the subjects in which the town was most interested, namely, the construction of a large dam across the Quinnipiac, and the consequent increase of manufacturing facilities in that vicinity.

The practical difference between the Wallingford, Oneida, Shaker, and other communist associations and the Mormons, appears to be that the latter live in open, flagrant violation of the laws of the land, while the former are law abiding, faithful people, who somehow or other manage to improve and increase the material wealth of the districts around them. But if their private morals are worse than their neighbors, we hope the home missionaries will not neglect them.

GREAT powers and natural gifts do not bring privileges to their possessors so much as they bring duties.

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HINTS TO INVENTORS.

The electro-deposition of metals has attracted the notice of inventors ever since the remarkable discoveries of Jacobi on the subject, and important applications of the knowledge obtained have been made; but there still remains a good deal to be done. Copper plate engravings have been, for a good many years, protected by deposits of hard nickel, but no one seemed to think of extending the application, to other purposes, until quite recently. Nickel plating has now become an important branch of industry, and we are likely to hear much more of its adaptation, to the wants of the arts, the more intimately we become acquainted with it.

There are other metals, which, although they may not promise the same brilliant results as nickel, are, nevertheless, well worthy of careful investigation; and to some of these, we propose to call attention. To begin with, there is manganese, an exceedingly abundant metal, which has been successfully deposited in the form of powder by electrolysis, and has been separated from its amalgamation with mercury, has been reduced at a high temperature, and obtained as a beautiful white metal when alloyed with copper; and yet we practically know nothing about its condition when deposited upon other metals. Some authorities say that the pure metallic manganese tarnishes readily in the air; others say that it is excessively hard, will bear a fine polish, and is not acted upon by ordinary reagents. The probabilities appear to be that it is a permanent metal, of a fine white color when perfectly pure; and, if a method could be found for depositing it in as thin layers as nickel or copper, it would have many valuable applications. Another metal, of still greater abundance, is magnesium. It is only recently that we have been able to prepare and study this metal in large pieces, and we have learned how to manipulate and use it. The next question is, how to decompose its salts in the cold by electrolysis, and plate with it. The metal tarnishes more readily than nickel, and the color is not so fine; but, as it has the remarkable property of throwing down most other metals from solutions, it may be useful as the basis for obtaining these metals for application in the arts. For example, a rod of copper, plated with magnesium, might serve as a method for reclaiming numerous metals from solutions. It is worth trying to find a cheap way of reducing magnesium, as it can be employed for the production of light in photography, and as a reducing agent, and for the preparation of chemical salts. A metal, upon which has been expended much time and research, is aluminum. This metal, as it is usually sold in commerce, is rarely pure, and hence it commonly has a dirty, tarnished appearance. We have seen specimens of it in thin leaves, which presented the white, brilliant appearance of silver, and did not readily tarnish. If aluminum in such purity could be deposited by electrolysis, it could be advantageously employed for many purposes in the arts; how to do this, is the question. It is not worth while for inventors to be discouraged, as it is only a short time since that electroplating was at all understood, and there is easy prospect of our learning much more about it. The three metals, manganese, magnesium and aluminum ought to be more easily obtained, and it is not very creditable to our science that we have not, long since, overcome the difficulty. Silicium, or silicon as it is sometimes called, the base of quartz, is the principal constituent of the crust of the earth. We tread it under foot and discard it in its elementary condition altogether; and yet it has marked properties, that suggest its use for many purposes in the arts We have seen an alloy of silicium with copper, which no steel file could scratch; and the chemist who prepared it, said that it could be cast at pleasure, in suitable molds, and he was not certain that it could not be annealed and worked the same as steel. The chloride of silicon can be easily prepared, and this is readily decomposed by sodium, yielding the silicon in pure condition. The chloride can also be reduced by aluminum, in which case the silicon appears in a crystalline form. Perhaps the best way of preparing the crystalline variety is to fuse 5 parts pulverized glass, 10 parts cryolite, and 1 part aluminum, and to wash the resulting slag in hydrochloric acid, and subsequently, in hydrofluoric acid.

Silicium in the form of powder can be obtained by fusing 15 parts silico-fluoride of natrium, 20 parts granulated zinc, and 4 parts of sodium, and washing the slag with hydrochloric and nitric acids. No way of depositing it by the battery has been invented. Silicium, according to our present imperfect knowledge, appears to occur in two conditions, amorphous and crystalline; but these forms are immaterial for our purpose. What we want is the metal, if it may be called a metal, ready for use in alloying with other metals.

The fact that silicium is not soluble in any acids, excepting a mixture of hydrofluoric and nitric acids, at once suggests its use for many chemical purposes.

It is a poor conductor of electricity, an exceedingly incombustible substance, even in oxygen gas; and its melting point appears to be between that of iron and steel; but the point of fusion of its alloys, according to the law that obtains on this subject, would doubtless be considerably less. The combination of silicium with magnesium affords an alloy that possesses remarkable chemical properties, and may offer a new compound, to be used as an explosive agent. It is made by fusing 7 parts of the silico-fluoride of sodium, 2·5 parts of chloride of sodium, and 2·5 parts of magnesium, and afterwards washing out the slag in chloride of ammonium. It is a crystalline substance, and, when dissolved in hydrochloric acid, gives off a gas which is spontaneously combustible. If the gas be evolved in a close vessel, where there is oxygen, the combustion ensues with an explosive force, white silicic acid being deposited on the walls of the vessel. It would appear to be well worth while to experiment with a substance of this marked character. It is in the production of alloys that we must look for the chief applications of silicium; and its uses in this direction, are, as yet, very imperfectly understood.

The above are a few of the metals to which we invite the attention of inventors.

MORE ABOUT THE LABOR QUESTION.

The public must become accustomed to see many discussions upon this absorbing question. It is destined to occupy, possibly for many years to come, a prominent place among current topics of newspaper and magazine literature. To those who, as capitalists or as working men, are immediately interested in its permanent settlement upon an equitable basis, as well as to such as make social science a study, it must, until settled, possess interest second to no other likely to be agitated during the present century. Like other social and political questions that involve the welfare of the masses, it has engendered and will yet give birth to bitterness and rancor, and perhaps—though God forbid such an event—to civil and international wars. No human eye can pierce the future; but any intelligent person may read, in the constant growth of the agitation, in the organized marshalling of the two great powers in the conflict, and in the defiant attitude of each, that neither will surrender, until one or the other has obtained a victory, or such mutual concessions and compromises shall have been made as shall bring about the desired adjustment.

At present the attention, of those who have carefully watched the signs of the times, is especially called to the failure, or partial failure, of the courts of arbitration established in England, and from which so much was hoped by Mr. Hughes, their ardent promoter, whose eloquent address at the Cooper Institute, during his visit to this country last November, was quoted and commented upon in this journal at the time.

We also shared the hope that, through these courts, the difficulties and disagreements that have so long burdened the industries of the world would find amicable adjustment, and that their wholesome influence would bring precedents for the establishment of similar courts in other lands. We regret that the result has not justified our hopes. The courts have satisfied neither the capitalist nor the working man, and though they have been the means of retarding crises, they have not been efficient in preventing them.

At the last meeting of the Board of Arbitration and Conciliation for the North of England Iron District, this dissatisfaction was so apparent that Mr. Hughes deemed it necessary to make a long and eloquent address in behalf of the continuance of the system, admitting that its value had been seriously called in question, and that the method is charged with being both expensive and unsatisfactory.

In the course of his argument, that gentleman admitted that neither the working men nor the iron masters would abandon their organizations, but thought that their being brought "face to face from time to time" was not without sufficient advantage to pay for its cost. This is a virtual admission that the system has failed to meet the purpose for which it was originated, and it is not probable that it will long continue.

We need not allude to special decisions and awards that have dissatisfied both employers and employed. It is enough that the dissatisfaction exists, even under the administration of such single minded and true philanthropism as that of Mr. Hughes and Mr. Mundella. Possibly there are features of the system, that, modified or abolished, would render it more acceptable, and we sincerely wish this may be found to be the case; for if, in such deliberations as have been held under this system, the differences have been seen to be so great that peaceable arbitration is not possible, what will the end be?

The persistent blindness of many to the magnitude of this labor question is a prominent feature of journalism. There are those who either ridicule, or treat in a jocose manner, events which are of the gravest importance, while others seem to think everything will all come out right, without social revolutions; or, if the latter occur, that they are far distant. Others see that there are contingencies that may bring about a labor crisis at any moment, and who raise the voice of warning.

To prove that the demands of the trades' unions are arbitrary and unjust amounts to nothing. They have found themselves in a position to enforce compliance with unreasonable demands. Though only a few of their leaders and comparatively few of those who oppose them realize it, they are making war against the wages system. They will drive capital so hard as to either compel it to withdraw from industrial enterprises or admit the employed into partnership. The wages system, as it exists, will ultimately be compelled to yield to another, if not a better, order of things.

Mr. William Taylor, at the Congress of the British Association, stated that out of 22,704,108 people in England, 8,144,000 do the work, and that they earn in the aggregate 267,000,000 pounds sterling, which, allowing them to work constantly six days per week, is equivalent to an average wages of twenty-one pence per day. A workman takes Mr. Taylor's figures as his text, and shows that the cost for food, of bread, meat, and potatoes, with the luxuries of two and a half pence worth of butter, sugar, and tea, sufficient for the sustenance of a workingman, is eleven and one half pence, leaving, according to Mr. Taylor's statement, less than ten pence per day for clothing, shelter, medicine, and all other demands.

We think Mr. Taylor's estimate of average wages must be too small, but allowing the average to be double that given, we have in it matter for serious reflection.

When working men have the intelligence to figure out such a sum as this, and compare their pittance with the unearned wealth of the nobility and State-fed churchmen of Europe need it be a matter of surprise that they are dissatisfied? How long need we expect them to remain quiet? What can courts of arbitration, that can only feebly affect their earnings one way or the other, do to convince such men that they are justly dealt with by society? That they are unreasonable need not surprise us; that they have been kept under restraint so long is simply because they have been, as yet, a hopeless minority in numbers and intelligence.

The above figures show that in England the part of society known as the working class are only a little more than one third the entire population. The history of the world has shown, however, that to perpetually oppress even a minority requires more than the might of numbers.

On the other hand it may be shown that industrial capital is really hard pushed as well as labor. In a remarkable letter, vouched for in the London *Builder* as coming from a genuine workman, appears the following paragraph relative to the condition of English manufacturers:

"Workmen and their leaders ought to know that, in the industrial race, the manufacturers are already closely run. In iron and cotton producing countries, the people are beginning to work the raw material. Any reader of the *Times* or the statistical abstract can see for himself the steady advance in exports which a few years ago were peculiar to England. Writers in the so called people's paper may ridicule the idea that other countries are making advance in competition with England. But it is a fact which no one can deny, that some engines and other goods have been imported into this country at a much cheaper rate than English manufacturers can produce them."

So it seems both labor and capital are hard pushed to feed and supply luxuries to the drones in the British hive.

Now if capital and labor could make common cause against the drones, instead of fighting each other, their combined efforts would bring about a better state of things, and the result of the present conflict will inevitably be in time a reorganization of society, in which producers and distributers of production will take pre-eminence over those who are at present fed from the public spoon. In the latter class are included all the paupers who live on homely fare in alms houses, those other paupers who wine and dine with liberal salaries in sinecure offices, those thieves who pick pockets in by-ways as well as those who rob the public purse by legislative jobs or fraudulent administration, gamblers in secret hells or public gamblers in gold and stocks, unnecessary middle men who insist upon clutching bread on its way from the producer to the consumer and cutting off their slice from the loaf, in short, all who, without doing anything for the general welfare, make wages low by making the necessities of life dear through their demand upon the productions of the industrious. All these must be turned out to gather their own honey. Then there will be enough for all. Then will eight hours for a day's work, and even less than that, be the rule without special legislation, and strikes will become things of the past.

ANOTHER GREAT PUBLIC WORK.

The almost unknown countries which form the interior of European Russia have been, of late years, rendered accessible by long and well constructed railroads, undertakings which, in an empire to a great extent thinly populated and divided in itself by vast plains, could never have been made but for governmental authority and substantial assistance in

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the form of guarantees. The spirited policy of the Czars has been well received by the Russian people, and now a greater and more formidable scheme is announced to the public.

In another column we give the details of the project, as set forth by a valuable European cotemporary. The mountains of the Caucasus bisect the territory which lies between the two seas; and the construction of the contemplated canal will be much simplified by using the river Manitscha, which flows westward into the Sea of Azov, and the river Kooma, Kouma, or Kuma, which flows, in the other direction, into the Caspian Sea. Moreover, a considerable part of the length of the river Manitscha is a long, deep, and wide lake; and these aids to the formation of the canal, reduce the entire distance, 441 miles, to very manageable dimensions. The cost in Russia, where labor is very cheap, is estimated at the moderate figure of $60,000,000.

M. Blums, the Russian topographer, who presided over the commission mentioned elsewhere, has published, in the *Golos*, a statement that the work will require the services of 32,000 men, to complete it in the specified time, six years.

At present the navigation of the Caspian Sea is left almost entirely to Persian vessels, and the report of the trade on this great inland lake shows that 824 vessels, of a united tunnage of 68,910, entered the harbors in the year 1869.

Plans and details for the prosecution of this work were found in the Imperial archives after the death of Peter the Great, and show how entirely he was convinced of the value, of such a work, to the interests of the great empire which he regarded with a fatherly pride.

The determination and courage of the Czar's government, and the great abilities of Russian engineers, as well as the importance of the work to the material prosperity of the empire, promise a speedy execution of this last great addition to the wonders of the nineteenth century.

THE HASSLER OCEANIC EXPLORATION.

One of the most important expeditions ever fitted out in the United States is now being organized in Charlestown Navy Yard, under the control of the United States Coast Survey, to whose superintendent, Professor Pierce, the credit of originating the idea is due. The *Hassler*, a vessel 165 feet long, well fitted and of ample power, is to convey a corps of scientific men, her officers and crew being selected especially with a view to their fitness for such service. The obj ct of the voyage may be briefly described as the investigation of the greatest depths of the Atlantic and Pacific oceans, of the origin of the deep sea currents, of the varied character of the water as to temperature, weight, and chemical elements, as well as of the fish and other animal life peopling the depths of the sea.

We are informed that the party will proceed first to the South Atlantic Ocean, and afterwards to the West Indies, to discover, if possible, the origin of the Gulf Stream. The next movement will be to ascertain the greatest depth of the Atlantic, and to search out the mysteries of the bottom. Returning to Rio di Janeiro for supplies, the *Hassler* will next proceed to the Atlantic coast of Patagonia, to trace the course of the South Pole currents. Proceeding by way of Magellan's Straits to the Pacific, a similar investigation to that made in the Atlantic will take place; and the ship will then go to San Francisco, where the scientific corps will leave her. She will then be engaged in the survey of the Pacific coast, and afterwards sail to Puget Sound, and perhaps to Alaska.

We look for important discoveries and results from this expedition. The physical features and character of the oceans are little understood, and it is impossible to solve the problems of the currents unless charts of the ocean bottoms, with some approach to accuracy, can be prepared, and some knowledge of the formation of the earth under the waters be obtained. Ocean navigation is now one of the largest industries in the world, and the interests of the commercial, mechanical, and scientific classes are all involved in its prosperity. Precise and detailed information as to the movements of the tides and currents which affect the transit of ocean going vessels has long been looked for, and there seems to be a great probability that it will soon be obtainable.

The scientific members of the party will be led by Professor Agassiz, and the dredging operations will be conducted by the Count de Pourtalés. The physical experiments will be under the charge of Dr. Hill, late President of Harvard University; the chemical inquiries will be made by Dr. White, of Philadelphia; and the geological and zoölogical department is intrusted to Dr. A. Steindacher. Professor Agassiz is in hopes of obtaining a large number of specimens which will add to our information of the *fauna* and *flora* of the deep.

The *Hassler* will, in all probability, sail from Charlestown, Mass., on about the 25th of November, and we shall keep our readers informed of her movements and of any discoveries that the distinguished body of scientists may make.

USES OF GLASS IN ARCHITECTURAL DECORATION, ETC

We have been much interested in the inspection of a miniature model of a bed chamber and its furniture, which an ingenious designer and personal friend has fabricated, and the prominent feature of which is the use of glass for decoration. The effects produced are very startling, unique, and beautiful.

The mantelpiece and its brackets are of highly polished and beautifully clear glass, attached to a base of black marble. The cornices are also of glass, the curved parts being of pressed glass, and the parts which are angular in section being ground and polished. The play of prismatic colors is hightened by reflection from the curved portions of the cornice, producing an effect wholly indescribable, but, in our opinion exceedingly beautiful.

The cornice is made in short segments, held at the ends by gilded supports of ornamental design. The walls are papered with delicate lavender with fine stripes of gold, and the upper edge passing under the glass cornice is without other border.

The ceiling has for a center piece a flat oval mirror, with an ornamental gilt frame, and from the center of this frame descends a small gas chandelier proportioned to the size of the model, profusely embellished with prismatic pendants and provided with Liliputian gas burners. The furniture is of polished black walnut, and is upholstered with lavender colored satin. The floor is furnished with a painted carpet, the colors of which harmonize with the general tone of color throughout the apartment.

The model has convinced us that for interior decoration, where expense is not regarded, a most beautiful effect can be produced on a large scale, as well as in the model, where the ornaments are somewhat out of proportion to the dimensions of the room.

Glass, when of the proper thickness, is scarcely more brittle than marble, and it has the advantage that it can be molded into the proper form, so that the greater cost of the material would be nearly or quite compensated for by the saving of labor.

The hint thus given may prove valuable to decorators, and is, we think, at least worthy of consideration.

A WORD ABOUT REPAIRS.

The inevitable waste and wear which always, in the end, necessitate the abandonment of everything in its day useful to mankind, is compensated for and retarded by repairs. But in the attempt to do this, there is often much time and money uselessly squandered.

One of the principal causes of loss is delay in making timely renovations and substitutions; another is injudicious ways of repairing; and, lastly, repairing that which it were wise to abandon altogether, Instead of at once correcting what is amiss in a tool or a machine, many will let it run as long as it is possible to work with it, when it is often found impracticable ever to make it serviceable again; or, if not so badly injured as this, that one deficiency, which it would have cost little to supply, has caused many worse than the first.

In making repairs it is often thought a poor mechanic will do just as well as better and more costly skill. No greater mistake can be committed. We assert that the mechanical ingenuity, ready command of resources, knowledge of the adaptability of means to ends, skill of eye and hand, common sense, and sound judgment—which go to make up an accomplished mechanic—are more necessary in a repair shop than anywhere else. Here it is not the same old routine, day after day, the making and putting together of forms so familiar as to require little original thought; but every job varies in some particular from every other, and each must be repaired in a different way. It requires brains as well as manual skill to do this kind of work in a creditable manner, and every manufacturer will find it policy to put a first class mechanic in his repair shop.

Lastly, in constantly stopping old machines to patch them up into make-shifts, there is often more money sunk than would supply their places with new ones. Many people estimate the cost of repairs only from the cost of material and labor; but in many cases the time lost in repairing is the largest element of expense, especially when the stoppage of one machine entails the stoppage of many others.

In repairing machines the following rules ought, therefore, to be observed: First. Repair as soon as anything gets out of order. Second. Intrust none but good mechanics with repairs. Third. Be careful not to continue repairs when machines cease to be worth them.

BOOKS FOR MECHANICS.

That sort of egotism which prompts mechanics and inventors to neglect the means of personal improvement and advance in their professions, supplied by books, has prevented many from achieving the measure of success to which their natural endowments entitle them, and is at the present day seriously affecting the condition of mechanics in general. Mechanics, as a rule, read newspapers, stories, and some history, but as a rule they neglect the books replete with technical information touching directly upon their peculiar avocations. They are wont to scoff at the idea of learning an art from books, and to place reliance upon their personal experience, in preference to any knowledge gleaned from the records of others' experience.

Now we do not deny the paramount value of personal experience. That which we have ourselves seen, we know; that which we read may at times mislead us; but when personal experience has been guided and shaped by reading, it must inevitably be more complete, its results better classified, and its value enhanced far beyond that of the knowledge of the man who has only explored his limited field of research without any guide.

A man might in time learn all about the streets, alleys, parks and suburbs of New York by unaided observation, but a well edited guide book would save him nine tenths the labor necessary to accomplish such a task without assistance.

We therefore advocate the use of books by mechanics, not as a substitute for personal experience, although they are in this way often very valuable; but we urge their use principally on the ground that they assist in enlarging and systematizing personal experience and preventing waste of time in the search for facts already discovered.

Every man engaged in any industrial occupation should gather about him a library, even though small, of works relating to his business. Verifying the facts stated in these books by his own experience, or, it may be, discovering that some things stated as facts are errors, cannot fail to enlarge his mind and supply him with practical resources for emergencies, which will not only increase his self respect but increase the pecuniary reward of his efforts. So true is this that we do not recollect a reading mechanic who did not rise in his profession, and who, though perhaps not acquiring fortune, failed to secure the respect always accorded to manifest superiority.

SCIENTIFIC INTELLIGENCE.

HOW TO TEST PURE GLYCERINE.

Thomas Koller gives, in a German journal, the methods for detecting the impurities of glycerin. Pure glycerin is neutral, and leaves only a slight residue when evaporated in a porcelain capsule. The adulterated article may leave considerable black residue, and react acid. Pure glycerin, when cautiously mixed with an equal volume of oil of vitriol, is not browned even after the lapse of several hours; the impure often browns immediately. A solution of oxalate of ammonia does not even produce a cloudiness when mixed with pure glycerin, but may give a precipitate with the impure. Pure glycerin, treated with nitric acid and nitrate of silver, yields no precipitate; sulphide of ammonia sometimes gives a black color in adulterated glycerin. Pure glycerin, in large and small quantity, is as clear as water; impure often shows different shades of color, according to the extent of its contamination. Pure glycerin rubbed between the fingers gives no greasy feeling, while the impure resembles fat. The freezing point of pure glycerin is near zero, while the impure may become solid at the same temperature as water. For the purification of glycerin, add ten pounds of iron filings to every 100 pounds of the impure liquid, and occasionally shake. In a few weeks, a black gelatinous sediment will settle and the supernatant liquid will be perfectly clear, and can be condensed by evaporation.

MALTIN.

A French chemist, Dubrunfaut, described, in 1868, a substance having all the properties of diastase, to which he gave the name maltin. According to his account, it possesses remarkable properties in promoting the fermentation of beer, and it has been strongly recommended in medicine. It is made by precipitating an extract of malt with tannic acid, filtering, washing well, and drying ready for use. Victor Griessmayer, reported in the Bavarian *Brewer's Gazette*, has been repeating some of the experiments of Dubrunfaut, and finds that although the aforesaid maltin possesses some of the properties attributed to it by its discoverer, it cannot be practically employed in brewing. He says: "Maltin is diastase of a decidedly platonic character." From these recent researches it would appear that the noise made about maltin is more in the nature of a trade speculation than of a genuine contribution to science, and that its medicinal character can probably be consigned to the same worthless category as its fermenting property.

"COSMOS."

Victor Meunier announces that *Cosmos*, so long conducted with such signal ability under his editorial management, and suspended during the siege of Paris, is to be discontinued, and in its place he will publish a weekly journal to be called *La France Scientifique*, the subscription price of which is to be ten francs per annum. The well known ability of the editor will ensure to subscribers a full return for the price of subscription.

A NEW ZINC PAINT.

M. Artus, connected with the Belgian Zinc Company, has prepared a zinc white, made up with silicate of potassa or soda and used to paint zinc and other objects. The material is something in the nature of a cement or artificial stone, and will withstand the action of the air, sun, and water. It can be employed to advantage on metal roofing, also on plaster, brick, and wood. Its chief value will be in rendering wood, paper, and tissues uninflammable, and for this purpose ought to be generally known. The value of the mixture for cements will also attract attention to it, and we shall probably hear of its extensive use as a constituent of artificial stone. The heat of rooms under roofs painted with this mixture was found to be 10° less than under the unpainted metal.

PRODUCTION OF BISMUTH IN SAXONY.

According to Wagner, it appears that Saxony produces 32,000 pounds of bismuth annually, and, as the yield of this metal in other countries is unimportant, Saxony rules the market of this article. A few years ago the pretended discovery of a method of making gold from bismuth led to the purchase of all there was in the market on the part of a credulous London firm. This produced considerable fluctuation in the price at the time, but as the firm were subsequently glad enough to get rid of their useless purchase at any price, the supply soon became abundant.

OXYGEN FOR PHARMACEUTICAL PURPOSES.

Dr. Baudrimont, in France, has published a lengthy paper on this subject. The author repeats the advice, long given by chemists, to calcine the black oxide of manganese previous to mixing it with the chlorate of potash, and to carefully pulverize the latter before mixing. He finds the proper proportions to be equal weights of these materials, and recommends the precaution of providing as wide tubes as possible, of washing thoroughly, of previously testing the chlorate, and of operating upon small quantities at a time.

A NEW REAGENT FOR COPPER.

The new reagent, proposed by Mr. Tamm, is obtained by

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dissolving, in distilled water, equal weights of sulphocyanide of ammonium and bisulphite of ammonia. When this is added to a liquid containing copper, it immediately precipitates white sub-sulphocyanide of copper, as an insoluble powder readily washed; while scarcely any other metal is affected by it. It appears to us that this combination of a sulphocyanide with a sulphite is capable of application in photography and ought to be tried. Its value in separating copper from other metals appears to be well ascertained.

GASES ABSORBED BY COAL.

Ernst von Meyer finds that the gases absorbed by coal are chiefly the following: Carbonic acid, marsh gas, nitrogen, oxygen, and hydrocarbons. He publishes a table with the interesting statement that more nitrogen is retained by coal than any other gas. If it be true that anthracite coal absorbs more nitrogen than oxygen, we have the germ of an important application, as this method could be employed to effect the separation of the nitrogen from the oxygen in the atmosphere, and lead to a cheap way of making oxygen. It may be worth while for some one to repeat the experiments with a view to attaining this desirable result. We give below the table of gases found by Meyer inclosed in coal:

Carbonic acid	16·9	22·4
Marsh gas	20·4	22·3
Nitrogen	53·3	48·0
Oxygen	1·7	4·1
Heavy hydrocarbons	7·7	3·2
	100·0	100·0

[Special Correspondence of the Scientific American.

HOLLY'S SYSTEM OF FIRE PROTECTION AND WATER SUPPLY.

WASHINGTON, D. C., Nov. 11, 1871.

The most severe conflagration that ever occurred in New York city was that of 1835, and $20,000,000 of property were destroyed. The late fire in Chicago destroyed, it is estimated, $200,000,000. Lake Michigan and Chicago river encircled the city, but were as impotent to save it as were the exhausted firemen and broken engines. They only environed the awful scene or steamed under the falling cinders.

The property of the Chicago Fire Department cost about $700,000, of which sum the fire engines and auxiliary apparatus cost about one half. The annual cost of maintaining the department was nearly $500,000. The water works were admirable of their kind, and cost considerably over $3,000,000. They embraced the famous tunnel extending far out into the lake, and a large and handsome building within which powerful machinery lifts the abundant waters to the top of a stand pipe 136 feet high. The gravitating pressure of this column of water was relied upon as the power for supplying the ordinary demands of the city through more than 200 miles of street mains, and also to furnish, in case of fire, twenty steam fire engines through a thousand hydrants. Was this the best system of fire suppression Chicago could have had? Might she not have been spared this terrible affliction? Cannot water be concentrated on a burning building so promptly, and in such measure, as to insure the rapid extinguishment of the devouring element, even under the adverse circumstances of high wind and severe cold? These are questions now very anxiously asked.

On a recent visit at Saratoga, I took occasion to examine the new water works of that place, and found the apparatus and general arrangement to be the same as was introduced into Lockport, N. Y., in 1863, Auburn in 1865, and still more recently into thirty cities in ten different states: Buffalo, Binghampton, Dayton, Covington, Minneapolis, Cumberland, Atlanta, etc.

The reservoir at Saratoga is about a mile from the village, and is formed by damming a small but abundant stream; and I learned, to my surprise, that it is several feet below the average level of the main streets. Just below the outlet of the reservoir, and situated on a still lower plane, is the well built and tasteful structure containing the machinery; and a glance at its nature, large proportions, and superior workmanship is sufficient to answer some of the questions of an interested visitor. The whole is known as "Holly's System of Fire Protection and Water Supply," and consists of a series of powerful rotary forcing pumps, worked by turbine wheels below, driven by water from the reservoir, or by a massive steam engine, according as circumstances require. In this case the water power is sufficient during more than half the year. The simplicity of the system is apparent to any observer, and experience has shown its economy and efficiency.

Its leading feature consists in this, that, independently of what is called a "gravitation supply," whether from an elevated reservoir, or a stand pipe constantly filled from a source on a lower plane, the mains of a city can be supplied with water in exact proportion to the demand; and in case of a conflagration, a power of propulsion can be given far exceeding in steadiness and degree that attained by any other means. By combining, with pumps so admirably constructed and arranged, a hydrostatic pressure regulator, the whole is placed under such perfect control that in twenty seconds the pressure can be increased from the ordinary measure, say sixty pounds to the square inch, to double that amount, or even triple, if required.

A telegraph line connects the works with the headquarters of the fire department in the town; but aside from this communication, a most delicate and automatic one exists in the apparatus itself, for the opening of a single hydrant in the most remote street is instantaneously indicated by the regulator, causing, at the same time, a bell to ring for the information of the engineer. Just after the works were completed in July last, a fire broke out in a hotel situated between the Union and the Clarendon, seriously threatening both; and about the same time another fire started, several blocks distant, among very combustible buildings and material. The village itself was in great danger, and, when both fires were speedily brought under control, the citizens were of the opinion that the works had, on that one occasion, saved the entire cost, and that the three steam fire engines heretofore depended on could not have been equal to such an emergency.

The following are the more evident advantages of the Holly system:

1. Dispensing with all locomotive fire engines.

2. A gravitation supply not needed, nor even an artificial reservoir, where a lake or river is at hand. At Binghampton the water is drawn directly from the Susquehanna, and at Cumberland, Md., from the Potomac.

3. The water is applied to a fire much more speedily than in any other way, or as soon as a hose can be attached to a hydrant.

4. The water is thrown more rapidly, and from one fourth to one third greater distance than by a steam fire engine; and the stream is steady and not exposed to irregularities and failures from the effect of extreme cold or defective machines.

5. Every building can have within it an effective extinguisher, and every private hydrant and water cock becomes a fire engine, effective in proportion to its size.

6. The propulsion is so great that long hose can be used, even half a mile, with entire success.

7. The great reduction of insurance rates—twenty-five and even fifty per cent in some cases.

Mr. Holly has devoted himself for years to devising improvements in the construction of pumps and their application to fire prevention. The records of the Patent Office show at least ten patents issued to him, one as early as 1849. Wherever adopted, the system has proved valuable and effective.

Replaceable Pivots for Watches.

When, heretofore, watch pivots have broken from their stems or spikes, it has been customary to bore into the remaining end of the spindle and insert a new pivot into the socket thus prepared. The boring of the very small spindles is a matter of difficulty, requiring delicate handling. It often happens that the spindles or axles break out while being bored, or that the boring tools break off during the operation and remain in the spindles, thus making the latter useless. When this occurs, it is necessary first to soften the spindles for boring, and then reharden them, thus adding still more to the cost and difficulty of repair.

The invention of Mr. Simon B. Simon, of New York, consists in the production of repair pivots, having tubular sockets, so that they may be slipped upon the ends of the spindles or stems when required, thus dispensing with the necessity of boring the spindles.

Electric Pyrometer.

A most ingenious and valuable application of the known fact that the resistance of metals, to the galvanic current, increases directly as the temperature, has lately been devised in Germany, The resistance of a platinum wire having been determined, a cylinder of clay is surrounded with such wire, and covered with a tube of the same earth. The coil is connected with a two cell Daniell's battery, and also with an indicator for the determination of the resistance, and subjected to the heat of which a test is required. Such an instrument would be valuable in temperatures at which mercury would evaporate and glass melt.

HOW TO ACQUIRE A GOOD MEMORY.—We read too much and think about what we read too little; the consequence is that most of the people we meet know something, in a superficial way, about almost everything. Not a tenth part of what is read is remembered for a month after the book or newspaper is laid aside. Daniel Webster, who had a rich store of information on almost every subject of general interest, said that it had been his habit for years to reflect for a short time on whatever he read, and so fix the thoughts and ideas worth remembering in his mind. Any one who does this will be surprised to find how retentive his memory will become, or how long after reading an interesting article, the best portions of it will remain with him.

As daylight can be seen through very small holes, so little things will illustrate a person's character.

Inventions Patented in England by Americans.

From October 19 to October 30, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

ANIMAL TRAP.—W. H. Chase (of New York city), London, England.
HARVESTER.—W. F. Goodwin, Metuchen, N. J.
ORDNANCE.—N. Thompson, Brooklyn, N. Y,
PAPER BOX MACHINERY.—H. R. Heyl, Philadelphia, Pa.
PHOTOGRAPHIC PICTURES.—F. A. Wenderoth, Philadelphia, Pa.
PISTON, ETC.—S. L. Wiegand, Philadelphia, Pa.
PRESERVING WOOD.—N. H. Thomas, New Orleans, La.
ROVING FRAME.—E. P. Morgan, J. H. McMullen, York, Me.
SEWING MACHINE.—D. Mills (of Brooklyn, N.Y.), Aston, England.
STEAM PACKING.—G. M. Cruickshank, W. R. Smith, Providence, R. I.
TRANSMITTING POWER.—W. F. Goodwin, Metuchen, N. J.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Lubricating Oils of Chard & Howe, 134 Maiden Lane, neither gum nor chill.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Vertical Engines—Simple, Durable, Compact. Excel in economy of fuel and repair. All sizes made by the Greenleaf Machine Works Indianapolis, Ind. Send for cuts and price list.

Metallic Molding Letters, for Pattern Makers to put on patterns of Castings, all sizes, etc. H. W. Knight, Seneca Falls, N.Y.

Wanted—A competent man to take charge of a Screw department as Foreman. A good steady man can have constant employment. Address Blees Sewing Machine Co., 89 John St., Brooklyn, N.Y.

The Pew Hat Rack. State and County Rights. E. S. Blake, Pittsburgh, Pa.

The best wood filler in use, 25 cents per lb. Made, used, and sent (in packages of not less than 16 lbs.) all over the country, C. O. D., by L. W. Jones, Unionville, Conn.

The best and cheapest Self Oilers are manufactured by Holland & Cody, 8 Gold Street, New York. Send for price list.

Hafner's Patent Eureka Coil Spring for Mill Spindles, is the only Spring constructed on scientific and the rotary principle. Mill-furnishers, millwrights, and millers, send for circulars and satisfy yourselves. Sample spring sent on trial to reliable parties. John A. Hafner, Santa Fe, Ill.

Land sufficient for the purposes of any good manufacturing business, and most admirably located on the Poughkeepsie & Eastern R. R., with plenty of water for steam purposes at hand, and only fifteen minutes' walk from the center of the city, will be given to any parties who who meet the views of the owner. Address P. O. Box 534, Po'keepsie, N.Y.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubribating Oil, 75 cts. Send for certificates. 116 Maiden Lane, N.Y.

Use Soluble Glass for fireproofing Wooden Pavements, Shanties, R. R. Bridges—also as common hardening Mortar and Cements, makes most durable Stove and Foundry Putty, Iron Cement. Apply to L. & J. W. Feuchtwanger, Chemists, 55 Cedar street, New York.

Francis Schleicher, Consulting, Analytical and Manufacturing Chemist. Laboratory, Newark St., between Jackson and Harrison St. P. O. Box 172, Hoboken, N. J.

One "Scott's Wheel Moulding Machine," saves $5,000 yearly in patterns—wheels absolutely perfect. Engraving sent free. Hamilton E. Towle, 176 Broadway, New York.

Portable Farm Engines, new and beautiful design, mounted on Springs. Compact, light, and efficient. Send for descriptive circular, Mansfield Machine Works, Mansfield, Ohio.

For the best 15 inch Eng. Lathes, Bench Lathes, or Friction Pulleys, address John R. Abbe, P. O. Box. 345, Providence, R. I.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N.Y.

I want the address of every cabinet maker and every painter in the world. J. Henry Symonds, P. O. Box 57, Boston, Mass.

Stencil Tools & Steel Letters. J.C.Hilton, 66W. Lake st. Chicago.

To Boiler Makers—Water Gauges sold cheaper by us than any other House in the Country. Holland & Cody, No. 8 Gold st., N.Y.

Baxter's Adjustable Wrenches fit peculiar corners where no other will work. All first class mechanics need one. Baxter Wrench Co., 18 Park Place, New York.

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Shoe Peg Machinery. Address A. Gauntt, Chagrin Fall, Ohio.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 107 Girard ave., Philadelphia, Pa.

Builder's Scaffold—Patent for Sale—For further particulars, address Redick & Kunkle, Butler, O.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Walrus Leather, for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane

Turkey Boxwood pieces for Sale, suitable for engravers and fancy turners' use. Address Stephens & Co., Riverton, Conn.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

The best lubricating oil in the world is Winter pressed Sperm. Sold in bottles, cans, and barrels, by Wm. F. Nye, New Bedford, Mass.

Vinegar—how made—of Cider, Wine, or Sorgo, in 10 hours F. Sage, Cromwell, Conn.

Best Oak Tanned Leather and Vulcanized Rubber Belting Greene, Tweed & Co., 18 Park Place, New York.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, each capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Blake's Belt Studs. The cheapest and best fastening for Rubber and Leather Belting. Greene, Tweed & Co., 18 Park Place, N.Y.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N.Y.

15 horse power Engine and Boiler, complete, for sale cheap. R. H. Norris, near West Street Bridge, Paterson, N.J.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year

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Examples for the Ladies.

A. Cady, of Cambridge, Mass., has used her Wheeler & Wilson Machine constantly in all kinds of dress-making, since the spring of 1858, without repairs, and it is now as good as new.

Burnett's Cocoaine for the hair takes precedence all over the United States.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

D. F. C., of N. J.—There have been no less than eleven patents taken on nickel plating.

J. M., of ——.—Inquire of your bookseller, or write to Baird, Philadelphia, for Box's "Practical Hydraulics." It contains all necessary tables and formulæ for the solution of most practical problems in hydraulics.

W. W. M., of ——.—Your query is not sufficiently intelligible.

E. C. B., of Wis.—To increase the capacity of an engine, beyond the capacity of the boiler, gives rise to loss through increased radiation and friction, owing to increased surface and weight of parts.

A. B. B., of Thames, N. Z.—We have no information relative to the use of rubber springs, for storing power, for the propulsion of street cars, etc., that we have not already published.

G. S. A., of Ind.—A fly wheel is an accumulator and distributor of power and a regulator of expenditure, not a creator, of power.

E. K. J., of Mich.—The only way to positively determine the initial pressure in the cylinder of your engine is to use the steam engine indicator. It is useless for us to guess at it for you, with only one element of information, namely, distance of cylinder from boiler.

J. W. G., of ——.—To restore horseshoe magnets that have lost their power from disuse, proceed as with new ones. Place the poles, of the magnet to be charged, against the poles of another, making opposite poles meet. Then draw a piece of soft iron, placed at right angles upon the magnet to be charged, from the poles to the bend. Do this a number of times on each side of the magnet. If the magnet is of good steel, this produces a maximum power. It is the method of Jacobi, and is considered one of the best.

W. G., of Pa.—We do not think tannate of soda is an article of general commerce as yet, though if it is as effectual in scaling boilers as stated by a former correspondent, it must inevitably become in great demand. It may be formed by slowly adding a solution of tannin to a solution of caustic soda.

A. P., of Cal.—Ewbank puts his steam current outside of the vacuum nozzle, which requires steam in large quantity to get the exhaust. Professor Draper puts the steam nozzle inside of the vacuum tube, which requires far less steam.

DAMAGED MIRROR.—Pour upon a sheet of tinfoil about three drams of quicksilver to the square foot of foil. Rub smartly with a piece of buckskin until the foil becomes brilliant. Lay the glass upon a flat table, face downwards; place the foil upon the damaged portion of the glass; lay a sheet of paper over the foil, and place upon it a block of wood or a piece of marble with a perfectly flat surface; place upon it sufficient weight to press it down tight; let it remain in this position a few hours. The foil will adhere to the glass.—C. T., of Vt.

H. B., of Pa., writes, in regard to an answer on hydraulic and steam pressure, Vol. XXV., page 281, that they are equal in effect on boilers. "I have always thought from what I have seen in testing boilers that water had greater effect than steam; as I have seen them leak under test, and have steam to same number of pounds, and no perceptible leak. I supposed it was because water was denser and the boiler was tight from not having the iron warm. I have two more subjects which have caused me some thought: Is not the bottom of the boiler more strained than the top, in proportion of the weight of water over steam?" . . . To the first we reply that the effects described as occurring with boilers under water pressure do not indicate greater strain, and are accounted for by our correspondent correctly. To the second query we answer in the affirmative. The third query is not intelligible.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—TINNING SHEET IRON.—I wish to know how tinning upon sheet iron is done, and how much it costs per pound.—G. H.

2.—WATER WHEEL POWER.—Will you please inform me how large a pipe it will require to supply a 20 feet overshot water wheel with sufficient water to run one run of three feet six inches and one run of two feet six inches burrs, with bolt, smutter, and two elevators. I can run the whole thing now with forty pounds steam, (boiler 18 feet by 3 feet 6 inches; engine 10 by 18 inches.)—W. G. D.

3.—BALLOONS.—What is the lightest and toughest material for small balloons?—J. H. B.

4.—INCRUSTATION IN BOILERS.—I noticed in a recent number of your paper that the tannate of soda has been successfully used to prevent incrustation in boilers. Please inform me how much is required for a locomotive boiler 18 feet long, 40 inches diameter, with 120 two inch flues, and how often it should be used.—J. H. W.

5.—SPRING IN SHAFTING.—Will shafting that has been heated and bent, and afterwards straightened and turned up, be likely to spring at the place where it was bent?—J. M. G.

6.—WORMS IN HICKORY.—I am engaged in a business in which a good deal of green hickory wood is used, and would feel obliged if any one can tell me of a simple preventive of worms, which often render it useless.—S. F.

7.—CUTTING BEVELS.—Can any of your readers give me a rule for cutting miter corners on beveled work? I am working in a wagon shop, and often want to cut a miter corner on a seat or body, where the corners are square, but the sides and ends, or some of them, are beveled. I have to go by the old cut and try rule, and a rule for cutting them would be of great service to me.—C. H. S.

8.—FACING FOR SAND MOLDS.—What can I use to dust over the surface or green sand molds to prevent the sand from burning, so as to produce clean bright castings? Should I use a flux in the process of melting?—W. Z. M.

9.—CEMENT FOR LEATHER.—How can I make a cement or glue, for joining leather, that shall be waterproof, strong, and not expensive?—G.

10.—PULVERIZATION OF GELATINE.—Can any of your readers tell me how to pulverize French gelatine to the fineness of flour?—H. M. C.

11.—PAINT FOR OUTSIDE WORK.—Will some of your correspondents give a recipe for an economical and durable wash or paint for outside work? Neutral color desired.—C. H. M.

12.—PRESSURE ON SLIDE VALVES.—In a steam engine, with flat slide valve, what proportion of the steam pressure, unbalanced and tending to produce friction, is there on the solid ends of the valve when sliding on the seat and not over the ports? How much is the pressure on the back counterbalanced by the steam between the valve face and the seat, without regard to ports or openings? What proportion of the weight of a steam engine, with flat slide valve, including steam pressure on its back, is required to move it, weight being applied direct?—F. A.

13.—PROPORTION OF KEY WAYS.—Please inform me if there is any rule laid down for the different sizes of key ways in shafts and wheels; and, if so, where I can procure it.—T. H. B.

14.—SPEED OF STEAM ENGINE.—Suppose that a steam engine has a cylinder 12x18 inches, with ports 1x10 inches, and is making 120 revolutions per minute, being very heavily loaded. Would it be better to give the engine more speed and enlarge the pulley driven by the engine, running the machinery as before? Would there be as much strain on the engine, and would there be much more friction on the slides, wristpin, and main journals, the work done by the engine being the same in both cases? The boiler that furnishes this engine with steam is a locomotive boiler with 357 square feet of heating surface.—E. F.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

ARE ALL PLANETS INHABITED?—C. M.

CHEMICAL FIRE ENGINE.—H.

PSYCHIC FORCE.—C. E. S.—J. S.—H. G.

WOOLEN MANUFACTURE.—S. S.

ANSWERS TO CORRESPONDENTS.—R. F. H.—S. C.—S. P. - T. A. R.—T. W.—W. G. E. H.

QUERIES.—E. N. S.—H. M.—J. W.—P. B.—R. F. H.—W.—W. W. M.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SCREWING BOLTS INTO BOILERS.—Allan Talbott, Richmond, Va.—The object in this case is to prevent leakage of water or steam from boilers by reason of the rusting of the plate bolts or from their becoming loose in consequence of strains put upon them in various ways. The desired end is attained by means of bushings or thimbles which have solid bottoms and are inserted in the bolt holes to receive the bolts.

PROCESS OF WELDING COPPER.—Christian L. Schurr and William G. Rehbein, Baltimore, Md.—This invention relates to a process whereby copper may be welded so as to produce as perfect a union between the surfaces in contact as can be produced in iron, a thing which has heretofore been deemed impossible.

ORE CRUSHING MACHINE.—Samuel Hughes, Charleston, S. C.—This invention relates to a metal shell lined with crushing ribs, and combined with an inclosed cone bearing similar crushing ribs on its exterior, the object of the machine being to reduce phosphatic rock to a size suitable for a thorough washing of the same.

ANIMAL TRAP.—Oscar S. Elving, Rome, Tenn.—This invention relates to a trap in which the animal entering steps upon a hinged floor that yields beneath it, which yielding, by means of intermediate mechanism, springs the trap; or, if the floor does not yield, the same result is accomplished by the pulling of the animal on the bait, the trap being provided with teeth which impale the animal, and also cast it out of the trap, so as to leave it in readiness for another.

STEAM GENERATOR.—William Byers, Philadelphia, Pa.—This invention relates to boilers made in separate compartments with fire spaces between them, and it consists in such compartments when constructed with bulged or swelled surfaces between the transverse retaining bolts.

HARVESTER.—John S. Truxell, Greenburgh, Pa.—This invention consists in an arrangement which enables the draft of the team upon a harvester to be regulated in such a manner as to counteract the resistance, offered to the sickle bar by the crop, whether the same be little or much.

DESK AND CHAIR COMBINED.—Archibald A. Porter, of Griffin, Ga.—This is an improved school desk or office chair, provided with a desk or writing board, so constructed that the said desk or writing board may be conveniently turned back out of the way.

BLASTING PLUG.—Julius H. Holsey, of Butler, Ga.—This is a new implement, to be inserted, previous to blasting, in the holes drilled into wood or rock, and is to receive the explosive charge, with the object of insuring greater safety in the preparation of the charge and more perfect results of blasting, without danger to the attendants. The invention consists in the use of a hollow pin, of wood, metal, or other material, made in two sections, to receive the charge and control its force.

BELL PIANO.—Carl G. G. Buttkereit, of Toledo, Iowa.—This invention consists in actuating bell hammers for musical instruments. To effect the desired result a combination of keys, dampers, toggles, and springs is employed, the details not being susceptible of verbal description, but involving only well tested and efficient elements of mechanism.

SELF HEATING SAD IRON.—Joseph Melder, of Munchen, Bavaria.—This is a self heating sad iron, so constructed that it will consume all the products of combustion before the same can escape, thereby avoiding inconvenience from smoke and gas. The invention consists in the application to the heater of plates and wire gauzs, which, when heated by the fire, will serve to consume the products of combustion. The invention consists also in the arrangement of receptacles for heating crimping and curling irons, the said irons being either removable or adjustable.

CLOTHES DRYER.—Hiram Knight, of Westminster, Mass.—This is a new construction of clothes frame, so made as to be self supporting in every position without requiring hasps or locks, and which can be folded together into a narrow space.

PROPULSION OF VESSELS.—John P. Bruce, of Brooklyn, N. Y.—This invention relates to a new mode of propelling marine vessels; and consists in driving the screw or propelling wheel by means of water wheels revolved or driven by water elevated by pumps, the latter being driven by a steam engine, the whole arranged in the specification with reference to accompanying drawings, without which the details cannot well be explained.

FORGE.—Joseph R. Morris, Houston, Harris Co., Texas.—This invention relates to an apparatus in which the gases from one or more forges, instead of passing off unconsumed, into the atmosphere, enter a furnace and are burnt therein, thereby furnishing heat for the generation of steam in a boiler connected with said furnace, which steam is used to drive a fan, that impels a blast into each forge, and is also used to propel an engine that operates a hammer; the exhaust from the engine being conducted to the tweers of the forges through pipes, in which are placed red hot iron plates, which decompose the steam, taking up the oxygen and liberating the hydrogen that is burnt in the forges.

MACHINE FOR MAKING PAVING BLOCKS.—Samuel Wallace Brooks, of Brownsville, Texas.—The cutting knife of this machine is hexagonal, or of any other form desired, and, being actuated by suitable mechanism, the wood, which has been previously sawn into proper lengths, is forced, by a weight, down, endwise upon the grain, upon the knife, which thus shapes the blocks. It is claimed that wood paving blocks may thus be rapidly and perfectly prepared.

MACHINE FOR SAWING SPOKES.—Thomas J. Tolan, of Delphos, Ohio.—This is a combination of a rotary saw, with two disks and a spring, together with other peculiarities in the machine, whereby spokes may be sawn from bolts, which is claimed to possess advantages over other machines hitherto used for this purpose.

IMPROVEMENT IN PLANING MACHINES.—Charles E. McBeth, Frederick Bentel and William C. Margedant, of Hamilton, Ohio, and Henry Climer, of Muscatine, Iowa. The reader is referred to page 255, current volume of the SCIENTIFIC AMERICAN, for a full description, with engravings, of this machine.

CORN PLANTER.—Abraham H. Stark and John C. Mitchell, of Nevada Iowa.—This is an improved self dropping, check row corn planter, consisting of a combination of a hopper having a single hole in its bottom; a measure of the quantity of grain to be planted; a case, arranged thereunder, having two holes and a slot in the top, and having one central discharge hole in bottom; with plates, rigidly connected, movable together, and having two holes apiece therein; and the tubes extending not quite to bottom of case. Also, a combination with an adjustable shoe, clasp and arm to fasten the said shoe detachably to the frame of the planter and the runner thereof.

PIPE WRENCH ATTACHMENT FOR MONKEY WRENCH.—A. H. Woodruff, of Lansing, Iowa.—This invention consists in a wedge shaped block of steel with teeth upon its inclined face, which is placed upon the movable jaw of a monkey wrench, and which has on each side a spring catch, which engages with the shank of the wrench when the block is in position. The teeth of the block will, when thus adjusted, engage with a pipe or rod so that the latter can be turned as desired.

SULKY CULTIVATOR.—Philip Hewitt, of Farmland, Ind.—The nature of this improvement precludes an explanation of details. The object sought is to render this class of cultivators more effectual and convenient in use, and to this end the inventor, while using many well known devices, adds fenders formed of spiral wire cords attached to plates on the inside of the cultivator plows, to protect the plants, and a peculiar construction of frame with its seat and levers, to render all parts of the machine easily adjustible and controllable by the operator.

HARVESTER.—George S. Grier, of Milford, Del.—This is an attachment of a studded carrier to the self raking apparatus of harvesters, with a gear shifting bar, so constructed that the carrier may be automatically thrown out of gear with its actuating mechanism, and thrown into gear by the driver, the design being to so improve the self raking attachment that its action may correspond to the varying quantity of grain in different parts of a field, and that the gavels may be made of nearly uniform size.

HORSE HAY FORK.—Charles A. Howard, Pontiac, Mich.—One part of the fork has two curved tines, the other part has only one curved tine. These parts are pivoted together and are further connected by bars, which are crossed and pivoted to the shanks of the two divisions of the fork. To these bars or links is attached a tripping device, which by pulling a cord releases the parts so that they open and discharge their load. We judge this to be a convenient improvement, and it certainly is simple, strong, and durable.

HAND SUPPORT AND ADVERTISING MEDIUM FOR STREET CARS.—Mahlon Warne, of Philadelphia, Pa. has invented an improved support and advertising medium for railway cars. A circular frame is composed of two similarly constructed parts, each provided with a groove, so that, when put together, they form a hollow ring for the reception of an endless cord on which is placed a round wooden bar or handle. The cord is tightly clamped between the circular sections by means of screws, but the handle slides freely thereon. The upper ear is slotted to admit of the attachment of a strap, whereby the device is secured to the roof rails of a car. Each of the sections of the frame is cast with an inner flange or rabbetted edge, whereby, when put together, a recess or annular groove is formed, suitable for the reception of circular plates of glass. Between these plates it is designed to place advertising cards, prints, or pictures. Thus, the prints while protected will be legible through the glass, and similar or different advertisements may be placed in the same frame, which, from the position of the frame in the car, it is manifest cannot fail of quickly attracting the notice of passengers. The support is free from a tendency or liability to cramp the hand of the person grasping it, adapted to conceal the junction of the ends of the cord, as well as tightly clamp the same, and is also a device calculated to adorn the car in which it is suspended, while incidentally constituting a most efficient means of displaying advertisements.

COMBINED DINNER PAIL AND LANTERN.—This invention relates to a new dinner pail which is provided with a lamp whereby its contents can be heated, and with a transparent side or door through which the rays of light from the lamp can be projected. Horace C. Ketcham and Willie W. Ketcham, of Newark, N. J., are the inventors.

HARNESS BUCKLE.—Othniel Brown, of Albia, Iowa.—This invention relates generally to harness buckles, but particularly to that patented December 21, 1858, by O. B. Smith. The cross bar of the frame of the buckle has a stud pin rising vertically from it to enter the hole of the strap to be buckled, which is passed under one cross bar and over another. A clamping bar or lever is pivoted in ears rising from the side bars of the frame, and bearing at the short end on the strap around the pin, a hole being made in the short end for the pin. The long arm is bent inward, so as to bear against the strap inside of the main frame and close to one of the cross bars in such a manner that the straightening of the strap by the tension of the draft will force the long arm of the lever out and the short one in, in a way to hold the strap more firmly, according to the strain.

TWINE CUTTER.—Charles Carrington Lewis, of Gainesville, Ala.—This is a new, simple implement to be used in stores, warehouses, etc., for the purpose of cutting twine and cords used for the tying of packages. The invention consists chiefly in applying the cutter to a pivoted balance weight, which is connected with a sliding bed on which the twine is cut. The bed is drawn in during the cutting process and moved out subsequently to bring the end of the twine or cord within convenient reach for future use. A spring holds the twine in contact with the movable bed.

LIGHTNING ROD COUPLINGS.—David W. Demorest, of Newark, N. J.—This is an arrangement of a lap and lock splice on the sections of rod, whereby the same are not only jointed but actually locked together. The invention consists, also, in the application of a screw to the coupling or bearing for locking one of the sections to the coupling, and thereby furnishing an absolute support.

CIGAR LIGHTER.—Joel B. Miller, of Rondout, N. Y.—This is a new pendent cigar lighter, similar to those now used in cigar stores, but so arranged that it will produce the flame by the consumption of kerosene or other burning fluid, instead of gas. The invention consists chiefly in so hanging the pendent burner and reservoir to a frame or arm that, by vibrating the former on its pivot, the wick will be shifted to give a greater or less flame as may be required.

WATER WHEEL.—Samuel D. Taylor, of Hazleton, Pa.—An improved mode of applying gates to turbine wheels; the effects of which are, first, to enable the gate to work close to the wheel, and thereby to bring the unchecked velocity of the water to bear upon the buckets as soon as it passes the throats; secondly, to admit of adjustment without changing the course of the water to the wheel. These effects are produced by means of a series of movable arc plates, and arc extensions of stationary chutes, combined concentrically and closely with the wheel and each other, so that the course of the water will not be changed (as where the chutes move) nor the velocity impeded, after passing the throats, by an adjustment of the gates.

BARK MILL.—Owen Coogan, of Pittsfield, Mass.—This is an improved machine for reducing or breaking up bark for tanners' use, whether the same be in a dry, damp, or green state. This invention consists in the arrangement of a hinged adjustable leaf with the feeding table and roll, and in the method or means of mounting the feeding roll, by which means the machine can be used for reducing all kinds of bark to a suitable degree of fineness, to best serve the purpose for which it may be intended. The manner of reducing or cutting, will, it is claimed, be quite uniform, and therefore most satisfactory. The feed roller, besides slowly supplying the cutters, serves also to hold the bark, so that it cannot slip or move out of the way when acted upon by the cutters. The cut bark is by the cutters carried off the back end of the table. The cutting-points of the saws or cutters may be of hard metal and removable on their blades, to be replaced when worn.

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WINDOW SASH.—John Groves, of New York city.—The invention relates to that particular class of window sashes, hinged at the bottom to a movable stile, and locked thereto and to the frame work at some point above. It consists in a double and reversible catch, which locks the sash to the stile and the stile to the frame. The sash is pivoted to the stile in the usual way, and fitted snugly thereinto against a suitable flange or stop. An improved catch bar, having studs respectively on each side of its free end and pivoted to the stile, is used. Slotted plates on the top of the sash, and slotted plates on the stile frame, receive the studs of the catch bar. By this construction one double studded and reversible catch on each side of the sash does all the ocking.

SUSPENDED LIFTING JACK.—Hector C. Havemeyer, of New York city.—This invention relates to a new manner of applying hydraulic lifting jacks, with the object of using them in warehouses, magazines, sugar houses, shops, &c., for holding, goods, hogsheads, or other devices, suspended, and conveying the same along elevated tracks from one to another part of the buildings. The invention consists in suspending the lifting jack from a truck running on an elevated track; in providing it with guide rods and a lower cross-piece, whereby it is adapted to the suspended position and to the operation of lifting goods from the floor; and in the application to it of a universal joint, allowing it to swing in either direction without running the truck off the rails, or springing the plunger. This is a good and practical invention.

PAVEMENT.—Hermann A. Gunther, of New York city.—This invention consists in making a concrete pavement or sidewalk, constructed so that it may be taken up in small sections. Between blocks of artificial stone or concrete, is placed gum, tar, rubber, (or other water repellant substance,) poured into the joints between the blocks while said substance is in a molten state. The effect produced is to form a completely water tight joint, while small sections of the stone may be taken up whenever desired by the application of heat to the joints.

APPARATUS FOR RELEASING HORSES.—James Harrison, of New York city.—This invention furnishes an improved apparatus for application to the stalls of a stable, which will enable all the horses or other animals secured in said stalls to be disengaged and led or drawn from said stable, when, in case of fire or other accident, there may be no time to enter each stall and disengage and lead out the animals one at a time, or when the said animals may be so frightened that they will not leave their stalls. An excellent device, which should be in every large stable.

ROCKING CHAIR.—John W. H. Doubler, of Darlington, Wis., assignor to himself and William Logue, of same place.—This invention has for its object to furnish an improved rocking chair, which will rock easily and noiselessly and will require no more room than an ordinary chair made without rockers A low stool or rocker bed, the side bars of which are flanged along the outer edges of their upper sides, said flanges serving as guards to keep the rockers rom lateral displacement, support the rockers, which are placed under the seat of the chair. To the outer sides of the flanged side bars of the stool or rocker bed are attached side boards or guards. to prevent anything from getting beneath the rockers. The chair legs are made short; and to their ower ends are attached short rockers; or, if desired, the legs of the chair may be omitted and the rockers attached directly to the chair seat. Springs gradually retard the movement of the chair in either direction, and finally stop it at the proper point, and then assist, by their stored up power, in reversing the motion of the chair.

EARTH PULVERIZER AND HARROW.—James Lefeber and George W. Shults, of Cambridge City, Ind.—This invention relates to a new way of more effectually pulverizing cloddy ground, after the plow, by arranging the broad points of rotary crushers in two sets, which act on the clod in lines at an angle to each other, and in a novel mode of locking the front crushers. A front set and a rear set of star wheels are arranged on horizontal parallel shafts extending across a frame mounted on them vertically to the direction in which the apparatus is to move. Each star wheel works independently of the other, and has a hub, working at the end against the hub of the wheel on each side, or one end of the hub of each outside wheel works against the frame. The arms of each set of wheels are arranged to work between the arms of the other set, at the sides between them for cleaning each other. The points of the arms of the front set are made broadest in the planes of rotation of the said wheels for cutting notches or channels in the ground in the direction of the movement of the machine, and the points of the rear set are made broadest in the planes of the axl s to cut across or perpendicular to the cuts made by the front set for increasing the cutting action on the ground, and these latter points are made broader at the outer ends than toward the axle, for facilitating the escape of the stones, clods, or other matters which might wedge between them if they were narrowest at the points. A cranked rod extends across the frame parallel with the shafts, and in such relation that when swung downward the points of the front set of wheels will be engaged by it so as to be held against rotation, and thereby act as common scratching harrow teeth. A hand lever is pivoted to the frame and arranged with the cranked rod, so that the latter may be lifted out of connection with the points, when they are to be left free to turn, which may be done while in motion. This machine is adapted to cultivating each side of a row of plants by removing one or more of the star wheels from both shafts at the center and applying loose sleeves, corresponding to the hubs thereat to confine the remaining wheels in the right positions, so that the vacant spaces may make room for the plants; and for the greater protection of the plants, especially from the action of the points, which are more likely to throw earth upon them, the protecting disks are applied on the shaft, inside of the wheels next the space, which effectually prevents any earth being thrown upon them. Such disks may be applied to both shafts. When the machine is used for pulverizing and harrowing, these disks are removed and the star wheels replaced.

SOLDERING APPARATUS.—Luke Albert Smith, Kansas City, Mo.—This relates to a new and improved device for holding tin cans for soldering them; and it consists in an expanding and contracting cylinder. A ring, with a vertical flange on the inner edge, is mounted on a suitable support, with an expanding and contracting cylinder of sheet metal, arranged within said flange and supported by an extension. At the side opposite this extension, the shell of the cylinder is separated longitudinally, and the parts lap each other considerably, suitable mechanism being employed to contract the cylinder. The cylindrical part of the can to be soldered is placed over the cylinder when contracted. The cylinder is then expanded, and the can to be formed swelled out against the flange into the required shape, and then held for soldering, after which the cylinder is contracted and the can removed.

HORSE POWER.—Hemphill Smith, Shelby Station, Tenn.—This invention relates to an improved arrangement of draft rope, windlass, and weight in connection with the frame of a horse power, in such a way that the wheel can be used either inclined or horizontally, either as a tread wheel or draft wheel. When used as a tread wheel, a rope is stretched along the frame and connected with a windlass, which may have a ratchet and pawl to be prevented from unwinding. The horses are hitched to this rope, the windlass serving to equalize their power. In connection with the rope may be weights suspended at the corners of the frame. The horses are hitched to these weights, and their breast straps connected with the rope. Their power will be increased the more they draw on the weights while treading on the wheel. This arrangement of rope and weight serves properly to control the animals during action, and dispense with the driver.

FLY TRAP.—Samuel F. McGown, Rockville, Ind.—The invention consists in a revolving wheel flue and a water tank containing water or other liquid. The face of the wheel is covered with molasses and water, or some other substance that will attract flies. The bottom of the flue covers a section of the wheel extending from or near the center to the edge of the wheel, and in width being equal to about half its length. The wheel revolves under the front edge of a flue or space, without disturbing the flies: but the back edge of the flue is dropped down so near the wheel that the flies, being disturbed, will rise from the wheel and fly upward toward the light, and, striking a plate glass, will drop to the water and be drowned. The wheel is revolved by clock work, and is noiseless and continuous in its action.

STENCH TRAP.—Michael Gafney, Newark, N. J.—This invention consists in the employment of a large vessel in connection with the pipe, made in two sections, the one leading into it extending nearly to the bottom, and the other leading from it connected near the top; the said vessel having a large opening at the bottom for cleaning it out, said opening being closed by a plug. The object of the improvement is to have a large trap in which all the grease will condense and be retained, instead of passing out into the pipes below and choking them up in inaccessible places, as is now the case with the small traps used in sinks, which become sufficiently heated by the quantity of warm water passing through them to maintain the grease in such a fluid state that considerable quantities are carried out into the pipes below. The usefulness, and practical character of this invention, will be apparent to any plumber who inspects it.

IMPROVED RAILWAY RAIL CHAIR.—Thomas Donahy, Empire City, Nevada.—This invention has for its object to furnish an improved railroad rail chair, designed for use one length of a rail from switch chairs, to avoid the necessity of frequently cutting rails to allow the switch to work. By this construction, as the rails expand and contract, one or more of pieces may be taken out and put in to keep the space between the rails properly filled, and, at the same time, to prevent the rail next the switch from being pushed toward and crowding the switch rail, and thus interfering with its proper working. The chairs are cast right hand and left hand, so that the detachable piece may always be upon the outer side of the rail. If desired, the chair may be made with a right hand and a left hand opening, a bar or partition being between them to get the doubled length of extension and contraction, thus giving a greater scope for adjustment.

TILT HAMMER.—Patrick Breen, Auburn, N. Y.—The object of this invention is to produce a mechanism connected with a tilt hammer, of suitable kind for retaining the drop on its rebound, and prevent it from falling again after the main stroke. The pattering of the drop on its return stroke is, in many cases—as, for instance, in minting—injurious, spoiling the fine execution of the main fall. To avoid this, the inventor has arranged a peculiar cam, which acts on the hammer or drop so as to catch it with a short arm on the rebound, and prevent it from falling again. The invention consists in a new combination of mechanism, whereby the cam is enabled to act on the drop, and in a new general arrangement of parts for moving or locking the cam, as may be desired. This brief notice will enable those familiar with the subject to see that this is really an important improvement in tilt hammers for fine work.

ROTARY STEAM ENGINE.—George V. Atwood, Mount Hope, Ala.—This invention relates to an improvement in that class of steam engines which receives steam continuously. A piston wheel, provided with disks and pivoted within a revolving cylindrical wheel, in combination with the spiral groove in the cylinder, for the admission of steam, and a steam wheel, cylinder and piston wheel, combined and arranged in a peculiar manner, constitute the invention.

LIGHTNING CONDUCTOR.—Othniel Preston, South Dansville, N. Y.—While the inventor is aware that it is contended that the conductivity of a lightning rod is according to the area of its cross section, his own experience, which has not been very limited in the business of manufacturing and putting up lightning conductors, leads him to doubt the entire correctness of that theory. In practice, he claims to have found that surface has much to do with the conductivity of lightning rods. Conductors composed of broad straps of metal having great superficial area and but slight cross sectional area, have been employed with good results. With a view of increasing the superficial area, conductors have been made of woven wire, and also of braided or plaited wire in the tubular form. This lightning conductor is, however, made of wires twisted together around a core or tube, and is in outward form the same as a wire rope, and continuous from end to end, and may be of any required length. In twisting the wires around a solid core, the core is withdrawn, which leaves the conductor tubular. If twisted around a metallic tube, the tube is allowed to remain, which also leaves the conductor tubular. In either case the conductor is a tube composed of wires twisted together, and having the strength and flexibility of a wire rope when made without the interior tube, but is, of course, more stiff and rigid when made with the tube.

WOOD BENDING MACHINES.—Hiram McDonald, Shortsville, N. Y.—Thills of one horse vehicles, to be bent, being confined to a former (whereon they have been previously bent, in a machine, to form vertical curves at the ends), are placed on a bed former or die whereon the final bending is to be effected. This consists in a long thin plate of metal, having the upper edge provided with the configuration necessary for imparting the form to the under side o the thill, and has four (more or less) pairs of bars attached to its sides and extending above the edge considerably higher than the depth of the pieces to be bent. The upper ends are mortised for keys. The pair of bars, at the end of the die where the curve is greatest, are arranged radially to the axis of the curve for having a better action on the pieces than they otherwise would. The upper former or die also consists of a long thin plate about the thickness of the pieces to be bent, having its lower edge formed on the curved line required for the upper side of the thill; and also having a shoulder projecting downward from said line at the point where the front ends of the thills terminate. It also has a prolongation at this end, arranged in the vertical guide, and is connected at the center of the top to a vertically reciprocating bar of a press for forcing it down upon the wood pieces to be bent, the said pieces being placed on the lower die between the bars, and the said die being placed on a suitable bed against stops, which latter serve as guides in adjusting it to the right position to receive the die between the bars. The upper die has a notch in the lower edge, opposite each pair of bars, to admit of driving a key into said bars, above the said pieces, after they have been bent by said upper die and before it is raised, to key the pieces fast to the lower die, to be held until they become sufficiently set to retain their form when released. Both machines have been patented by the same inventor.

NEW BOOKS AND PUBLICATIONS.

The London GRAPHIC is probably the largest and finest printed illustrated weekly newspaper published in the English language. From it are largely drawn the engravings that appear in our American illustrated weeklies. The general reading matter is, of course, more adapted to English than to American readers; but the illustrations, and the sketches which accompany them, are of interest to readers everywhere, as they form an epitome of the most important current events in all parts of the civilized world. Like other first class English literary publications, it is edited with great ability. This splendid paper is now supplied regularly to every part of the United States. By sending, direct to the publishers, one pound sixteen shillings in a money order, any one of our readers may obtain it, with the Christmas and all the extra numbers. United States postal orders should be addressed and made payable to E. Mansfield, office of the *Graphic*, 190 Strand, London. The *Graphic* may be also had of August Brentano, 33 Union Square, N. Y., or Willmer & Rogers, 47 Nassau street, N. Y.

THE ANNUAL REPORT OF THE COMMISSIONERS OF PUBLIC PARKS, for the Year ending May, 1871. New York: William C. Bryant & Co.

This is a voluminous and handsomely printed document, making a royal octavo volume of 427 pages. It is profusely illustrated with photographs, lithographs, and wood engravings—the latter, however, on account of their inferior quality, detracting from, rather than adding to, the attractions of the volume. It contains a List of Commissioners and Officers—the Annual Report of the Department—Reference to the Central Park Map—a Legal History of the Department Jurisdiction—Report of the Comptroller—Topographical Description of the Central Park—Gifts, Devises, and Bequests—Lists of Animals—Reports of various Officers, etc. etc. The Report will prove of great value to those interested in the progress of our city improvements.

THE GREAT FIRES IN CHICAGO AND THE WEST. History and Incidents—Losses and Sufferings—Benevolence of the Nations, etc. etc. By a Chicago Clergyman. To which is appended a Record of the Great Conflagrations of the past. Illustrated with Maps and Scenes. Published by J. W. Goodspeed, Chicago, Cincinnati, St. Louis, and New Orleans. H. S. Goodspeed & Co., 37 Park Row, New York.

This is a book of remarkable interest, and which is certain to meet with a large sale. As a record of incident connected with the greatest fire that has yet visited an American city, it is worth preserving in every library.

A REVIEW OF THE THEORY OF NARROW GAUGES, as applied to Main Trunk Lines of Railway. By Silas Seymour, General Consulting Engineer. New York: D. Van Nostrand, Publisher, 23 and 27 Warren Street.

This pamphlet is undoubtedly one of the most able reviews of the narrow gage question that has yet appeared. It expresses the views of one of the most clear headed and far sighted of our American railway engineers, which those who peruse the book will see coincide to the opinions we have, from time to time, expressed relative to the fallacy of most of the arguments in favor of narrow gages. In another column, we publish some of the most pointed of Mr. Seymour's able arguments in favor of wide gages; and though, as the title implies, these arguments are intended to apply to "Main Trunk Lines," they lose nothing of their force when branch lines are under consideration The pamphlet is timely, and will do much toward correcting false ideas upon the policy of adopting in haste what we think is sure to be repented at leisure.

SUPPLEMENT TO BICKNELL'S VILLAGE BUILDER. Containing Eighteen Modern Designs for Country and Suburban Houses of Moderate Cost. With Elevators, Plans, Sections, and a variety of Details, all drawn to Scale. Also, a full set of Specifications, with Approved Form of Contract and Estimates of Cost. New York: A. J. Bicknell & Co., Architectural Book Publishers, 27 Warren Street. Price $5.

The eighteen designs, some of which are handsomely colored, embraced in this book, are contributed by six architects of recognized skill and experience in village building. The designs are remarkably neat and tasteful and are so drawn and engraved, in connection with explanatory plans, elevations, and notes, that the peculiar adaptation of each to individual wants can be understood by any non-professional man of ordinary intelligence. The book is, therefore, an excellent guide for those about to build, as not only the essentials to handsome, comfortable village residences are comprised in the designs, but variety enough is presented to meet most requirements.

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FOR THE WEEK ENDING NOVEMBER 14, 1871.

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120,809.—WASHER.—W. Arnold, Pawtucket, R. I.
120,810.—DRYING PAPER, ETC.—H. Dodge, Aibany, N. Y.
120,811.—STOVE.—W. Doyle, Albany, N. Y.
120,812.—VARNISH.—T. J. Elliott, New York city.
120,813.—HORSESHOE.—D. Grim, Pittsburgh, Pa.
120,814.—BANDAGE.—J. G. Groocock, New York city.
120,815.—SEWING MACHINE.—T. J. Harper, Atlanta, Ga.
120,816.—INHALER.—R. B. Heintzelman, New York city.
120,817.—RUFFLER.—E. L. Howard, Malden, Mass.
120,818.—MOP HOLDER.—G. B. Isham, Burlington, Vt.
120,819.—PUMP.—S. W. Kelly, Nashville, Tenn.
120,820.—RIGGING.—J. C. Knowlton, Providence, R. I.
120,821.—BOTTLE STOPPER.—G. C. Lowe, New York city.
120,822.—PADLOCK.—S. Loyd, New York city.
120,823.—CANAL BOAT.—J. M. McMaster, Rochester, N. Y.
120,824.—GAS MACHINE.—W. T. McMillen, Richmond, Ind.
120,825.—STAND.—J. R. Palmenberg, New York city.
120,826.—THRASHER.—A. V. Pitts, Chicago, Ill.
120,827.—AUGER.—R. L. Priester, Souder's Station, Md.
120,828.—GRAIN BINDER.—M. T. Ridout, Sun Prairie, Wis.
120,829.—ROOFING.—J. Siddons, Rochester, N. Y.
120,830.—CORK PULLER.—C. T. Simpers, Philadelphia, Pa.
120,831.—WASH BOARD.—A. D. Smith, Grafton, Ohio.
120,832.—POTATO DIGGER.—J. Smith, Ridgeville, Ohio.
120,833.—CHAIR.—P. M., O., A. S. Snell, Williamsburgh, O.
120,834.—KILN.—D. M. Sprogle, Annapolis, Md.
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120,853.—WATER METER.—C. Campeaux, New York city.
120,854.—LINK JOINT. C.B. Carpenter, North Attleborough, Ms.
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120,881.—BED.—J. Johnson, Hartford, Conn.
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121,017.—THIMBLE.—A. Talbott, Richmond, Va.
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121,030.—JACK.—J. Weathers, Greensburg, Ind.
121,031.—BANDING.—G. W. Weeks, Clinton, Mass.
121,032.—CAR WHEEL.—J. M. Whiting, Providence, R. I.
121,033.—HANK.—G. C. Williams, Boston, Mass.
121,034.—CHAIR.—G. Wilson, Chicago, Ill.
121,035.—RAKE.—J. E. Wisner, Friendship, N. Y.

REISSUES.

4,634.—LOZENGE MACHINE.—O. R. Chase, Boston, Mass.—Patent No. 39,196, dated July 7, 1863.
4,635.—SEDIMENT COLLECTOR.—C. W. Deane, Philadelphia, Pa.—Patent No. 113,405, dated April 4, 1871.
4,636.—SHEARING MACHINE.—T. E. Harris, Green Bay, Wis.—Patent No. 67,429, dated August 6, 1867.
4,637.—VISE.—J. Simpson, Cleveland, Ohio.—Patent No. 119,658, dated October 3, 1871.

DESIGNS.

5,363.—BURIAL CASE.—S. Stein, Rochester, N. Y.
5,364.—HAND STAMP.—W. N. Weeden, Boston, Mass.

TRADE-MARKS.

527.—TEAS.—Allen, Shapleigh & Co., Boston, Mass.
528.—WAGONS.—S. N. Brown & Co., Dayton, Ohio.
529.—CORSETS.—M. Cohn & Co., New York city.
530.—ATTACHMENT.—Domestic Sewing Machine Company, Toledo, Ohio.
531.—GIN.—Gill & Lootz, Boston, Mass.
532.—MEDICINES.—J. J. Haley, San Francisco, Cal.
533.—PINE APPLE BEER.—Q. A. Hooper, Attleborough, Mass.
534.—MEDICINE.—A. J. Hopkins, Providence, R. I,
535.—FERTILIZER.—J. Horner, Jr., Baltimore, Md.
536.—BILLIARD TABLES.—Kavanagh & Decker, N. Y. city.
537.—BREAD.—J. F. Kohler, New York city.
538.—COTTON SHEETINGS, ETC.—The Jackson Company, Nashua, N. H.
539.—CORSETS, SKIRTS, ETC.—Thomas, Langdon & Co., New York city.
540.—SKIRTS.—Thomas, Langdon & Co., New York city.
541.—CORSETS.—Thomas, Langdon & Co., New York city.
542.—CORSET.—Thomas, Langdon & Co., New York city.
543.—SKIRTS AND CORSETS.—Thomas, Langdon & Co., New York city.
544.—GIN.—C. & W. A. Waters, Boston, Mass.

EXTENSIONS.

MOWING MACHINE.—J. P. Manny, of Rockland, Ill.—Letters Patent No. 18,510, dated October 27, 1857.
GRINDING AND POLISHING MACHINE.—D. Lovejoy, of Lowell, Mass., and E. S. Butterfield, of Rockingham, Vt.—Letters Patent No. 18,509, dated October 27, 1857.
HARVESTERS.—H. Willard and R. Ross, of Vergennes, Vt.—Letters Patent No. 18,562, dated November 3, 1857; reissue No. 1,775, dated September 27, 1864.
HARVESTER.—H. Willard and R. Ross, of Vergennes, Vt.—Letters Patent No. 18,562, dated November 3, 1857; reissue No. 1,776, dated September 27, 1864.
HARVESTER.—H. Willard and R. Ross, of Vergennes, Vt.—Letters Patent No. 18,562, dated November 3, 1857; reissue No. 1,780, dated September 27, 1864.
HARVESTER.—H. Willard and R. Ross, of Vergennes, Vt.—Letters Patent No. 18,562, dated November 3, 1857; reissue No. 1,781, dated September 27, 1864.
SEWING MACHINE.—E. H. Smith, of Bergen Heights, N. J.—Letters Patent No. 18,605, dated November 10, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

PLOWS.—George Watt, Richmond, Va., has petitioned for an extension of the above patent. Day of hearing, January 24, 1872.

GRINDING ATTACHMENT PUG MILL.—David H. Gage, Dover, N. H., has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

LAP JOINTS FOR BELTING.—Henry Underwood, Tolland, Conn., has petitioned for an extension of the above patent. Day of hearing, Jan. 24, 1872.

BANK CHECK CANCELERS.—William M. Simpson, Newark, N. J., has petitioned for an extension of the above patent. Day of hearing, Jan. 31, 1872.

KNITTING MACHINE.—Joseph K. Kilbourn, New Britain, Conn., and Edward E. Kilbourn, New Brunswick, N. J., have petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

PROPELLING CANAL BOAT.—Herman Camp, Rouseville, Pa., has petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

HARVESTER.—Frederick Nishwitz, Belvidere, N. J., has petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

SHINGLE MACHINE.—George Craine, Fairfield, Iowa, has petitioned for an extension of the above patent. Day of hearing, January 31, 1872.

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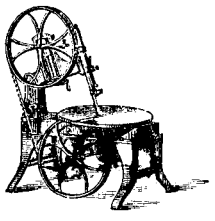

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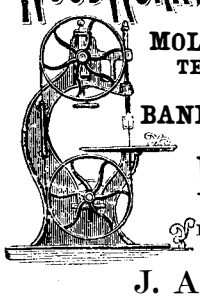

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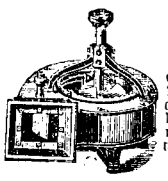

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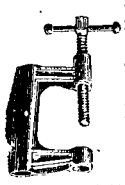

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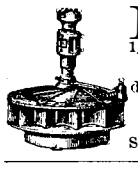

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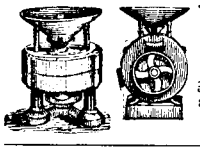

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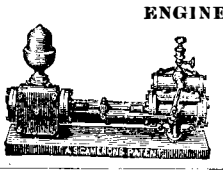

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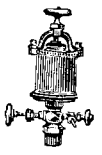

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